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VENABLE'S ARITHMETICS—NEW TWO-BOOK SERIES.

ELEMENTARY ARITHMETIC

BY

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PROFESSOR OF MATHEMATICS IN THE UNIVERSITY OF VIRGINIA

NEW YORK
UNIVERSITY PUBLISHING COMPANY
1892

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PREFACE.

In this work, the first of a two-book series of arithmetics, the author has sought to present an elementary treatment of numbers illustrating methods now approved as best adapted to the needs of the school-room.

The First Steps, forming Part I., indicate the methods used with success by progressive teachers in the lowest primary classes of graded schools. The pupil beginning his school life meets in this part of the book a training which, continuing the best of his home instruction, gradually and pleasantly introduces him to the restraint of forms of thought and language necessary in numerical processes.

The pictures of Part I., in appealing to the imagination of the pupil, afford opportunities for language lessons, and suggest simple combinations in the study of numbers. The story that the child makes about the objects represented in the picture soon gives place to the problem in arithmetic.

The problems in the beginning of the book are, of course, for dictation by the teacher; while the sight and the copy exercises are for the use of the pupil with the book or from the blackboard.

The ever-varied expression in the problems, throughout

the book, calls into exercise the judgment of the pupil and enables him to repeat again and again the various combinations in numbers, without being conscious of the monotony that generally attends drill exercises.

All that is purely technical has been carefully avoided, the effort of the author having been to make the book replete with thoroughly well-graded problems, oral and written.

In the preparation of this book, the author's Primary and Intermediate Arithmetics have been revised and rewritten. While it is the introductory book in the new series, it will be found sufficiently comprehensive for pupils unable further to pursue the subject, as it provides them with the essential business forms and applications.

The author has sought to have both books of the series full of systematic work for the pupil, and of suggestive help for the teacher.

Acknowledging the large assistance of Mr. S. T. Stewart, of Brooklyn, N. Y., and the valuable suggestions and aid of other skilled and experienced teachers, the author with confidence submits the series to the judgment of his fellow-teachers.

C. S. V.

UNIVERSITY OF VIRGINIA,
April, 1888.

CONTENTS.

PART I.

First Steps in Numbers.

	PAGE
One to Ten,	1
Ten to Twenty,	22
Twenty to One Hundred,	41
One Hundred to One Thousand,	61

PART II.

Fundamental Rules.

Notation and Numeration,	79
Addition,	84
Subtraction,	92
Multiplication,	100
Division,	117

Common Fractions.

Notation and Numeration,	137
Addition,	139
Subtraction,	146
Multiplication,	152
Division,	162

DECIMAL FRACTIONS AND UNITED STATES MONEY.

PAGE

Notation and Numeration, ... 175

Reduction, ... 178

Addition and Subtraction, ... 181

Multiplication, ... 183

Division, ... 186

PERCENTAGE, ... 194

INTEREST, ... 202

BUSINESS FORMS, ... 205

MEASUREMENT, ... 207

Addition of Compound Numbers, ... 215

Subtraction of Compound Numbers, ... 216

Multiplication of Compound Numbers, ... 217

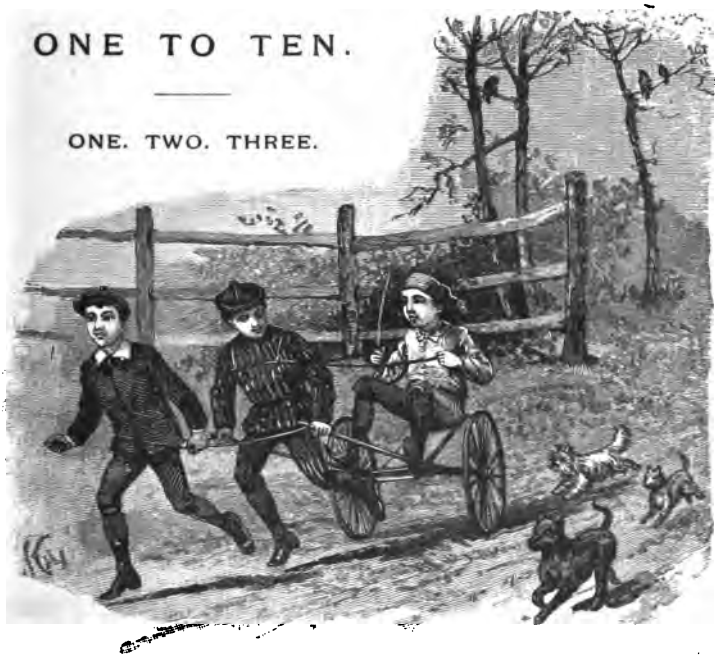
Division of Compound Numbers, ... 217

MISCELLANEOUS PROBLEMS, . . 98, 114, 131, 151, 170, 191, 200

ANSWERS, ... 219

ELEMENTARY ARITHMETIC.

PART I. FIRST STEPS.



1. 1. What do you see in this picture? Tell all about what you see.

2. What are the boys doing? How many horses has the driver?

3. One horse and one horse are how many horses?

One horse and ***one*** horse are ***two*** horses.

4. Two boys and one boy are how many boys?

Two boys and ***one*** boy are ***three*** boys.

5. Two birds sit together on a branch of one of the trees. How many other birds do you see in the picture?

6. Two birds and one bird are how many birds?

Two birds and ***one*** bird are ***three*** birds.

7. Two and one are how many?

Two and ***one*** are ***three.***

2 + 1 = 3

8. How many trees do you see in the picture?

9. Are the trees all standing together?

10. How many trees are two trees and one tree?

11. How many dogs are following the boys? Are they all white dogs?

12. How many white dogs are there? How many black dogs?

13. How many dogs are one dog and two dogs?

14. One and two are how many?

One and ***two*** are ***three.***

1 + 2 = 3

15. How many apples are two apples and one apple?

16. One pear and two pears are how many pears?

17. If the little bird that sits alone should fly away, how many birds would be left in the trees?

18. Three birds less one bird are how many birds?

19. Three less one are how many? One from three = ?

Three less ***one*** are ***two***.

3 − 1 = 2

20. If the two birds should fly away first, how many birds would be left in the trees? Three birds less two birds = ?

21. Three less two are how many? 3 − 2 = ?

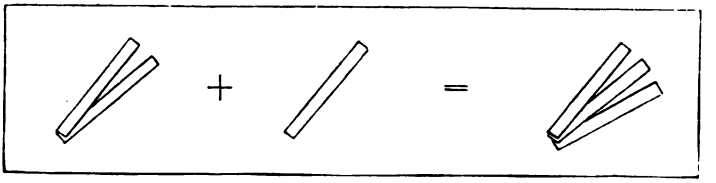
Three less ***two*** are ***one***.

3 − 2 = 1

22. What story of the birds does 3 − 2 = 1 tell?

23. Hold up one splint. Two splints. Three splints.

24. Hold up two splints in the left hand. Hold up one splint in the right hand. Put them all into the left hand.



25. Two splints and one splint are how many splints?

26. Hold up two splints in the right hand. Hold up one splint in the left hand. Put them together in the left hand.

27. One splint and two splints are how many splints?

28. Hold up three splints in the right hand. Take one of them away. How many splints are in the right hand now?

29. Three splints less one splint are how many splints?

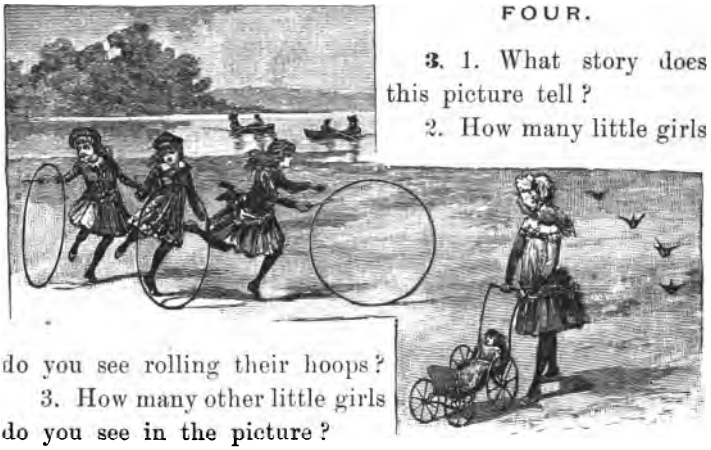
30. Hold up three splints in the left hand. Take two of them away. Three splints less two splints are how many?

31. What mark means to put together or to add?

32. What mark means to take away?

2. Make stories for:

1. 2 + 1 = 3. *2.* 1 + 2 = 3. *3.* 3 − 1 = 2. *4.* 3 − 2 = 1.



FOUR.

3. 1. What story does this picture tell?

2. How many little girls do you see rolling their hoops?

3. How many other little girls do you see in the picture?

4. Three girls and one girl are how many girls?

5. Three and one are how many? One and three = ?

Three and ***one*** are ***four.***

$$3 + 1 = 4$$

6. How many carriages do you see? How many boats? How many hoops? How many birds?

7. How many wheels has the doll carriage? How many more wheels than hoops do you see?

8. One from four leaves how many? Four less one = ?

Four less ***one*** are ***three.***

$$4 - 1 = 3$$

9. If the three little girls that are rolling hoops should run with them out of sight, how many little girls could then be seen?

10. Four less three are how many? $4 - 3 = ?$

11. Take four splints and separate them: 1. As the girls are separated; 2. As the people in the boats are separated.

12. How many boats do you see in the picture?
13. How many people are there in each boat?
14. How many people are there in the two boats?
15. Two and two are how many? Two twos = ?

Two and ***two*** are ***four.***

2 + 2 = 4

16. How many twos are there in four?
17. If the man in one of the boats should row his boat out of sight, how many people could be seen on the water?
18. Two from four leaves how many?
19. Four less one are how many? Four less two = ?
20. Four less three are how many? Four less four = ?
21. If both men should row their boats out of sight, how many boats could be seen on the water?
22. Two boats from two boats leaves how many boats?
23. Two from two leaves how many?
24. Two less two are how many? Two less two = ?

Two less ***two*** equals ***nothing.***

2 − 2 = 0

25. If one of the two boats is rowed out of sight, how many boats could then be seen? Two less one = ?

4. Copy and complete:

1	2	3	2
1	1	1	2
2	3	4	

5. Make stories for:

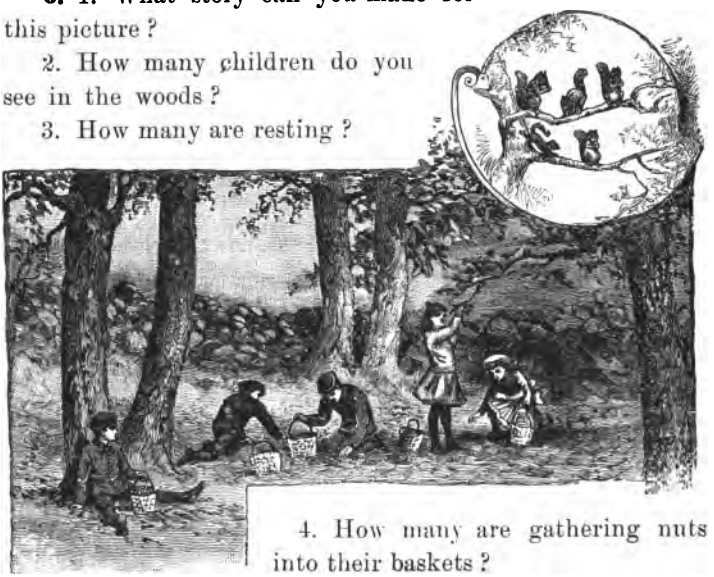
1. 3 + 1 = 4. 2. 2 + 2 = 4. 3. 4 − 3 = 1. 4. 4 − 2 = 2

FIVE.

6. 1. What story can you make for this picture?

2. How many children do you see in the woods?

3. How many are resting?



4. How many are gathering nuts into their baskets?

5. Four and one are how many? One and four = ?

Four and ***one*** are ***five***.

$$4 + 1 = 5$$

6. How many baskets are full of nuts? How many are not full? 1 + 4 = ? 4 + 1 = ?

7. If the boy that has filled his basket should leave the other children, how many children would be left?

8. One from five leaves how many? Five less one = ?

Five less ***one*** are ***four***.

$$5 - 1 = 4$$

9. If the four children that are still gathering nuts should fill their baskets and walk away, how many children would be left? Five less four = ?

10. How many boys do you see in the picture? How many girls? How many children do you see?

11. Using splints, can you answer this and the other questions about the children gathering nuts?

12. How many trees are there near the boy that is resting? How many other trees are there?

13. How many trees are there altogether in the picture?

14. Three and two are how many? Two and three = ?

Three and ***two*** are ***five.***

3 + = 5

15. If the girls go home, how many children will be left in the woods?

5 − 2 = 3

16. If the boys all climb the trees after the squirrels, how many children will there be on the ground?

5 − 3 =

17. How many squirrels do you see in the trees?

18. If the three squirrels on the upper branch run away, how many squirrels will remain?

19. If a woodman chops down the two trees at the left, how many trees will remain standing?

20. Three pears and two pears are how many pears?

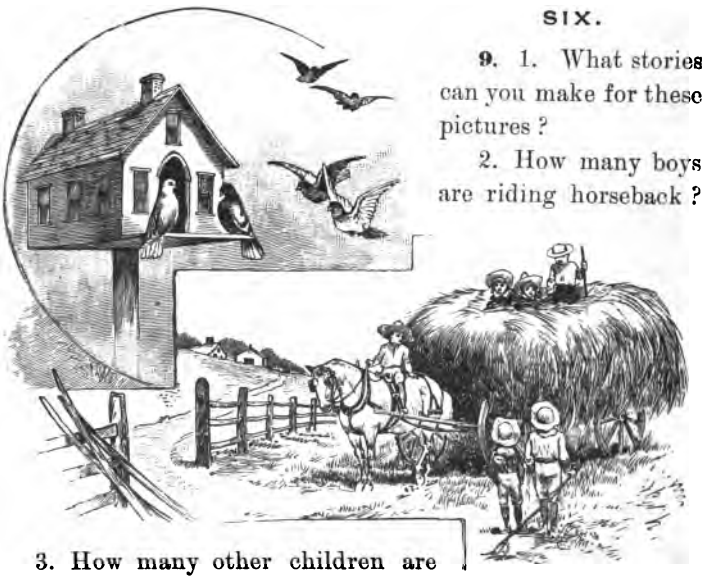
7. Make stories for:

1. 4 + 1 = 5. *2.* 3 + 2 = 5. *3.* 5 − 1 = 4. *4.* 5 − 3 = 2.

8. Copy and complete:

5	4	3	2	1
0	1	2	3	4
5				

SIX.



9. 1. What stories can you make for these pictures?

2. How many boys are riding horseback?

3. How many other children are there? Five and one are how many? One and five = ?

Five and ***one*** are ***six.***

5 + 1 = 6

4. If the boy on horseback should go to the barn and leave the other children with the hay-wagon, how many children would be left? Six less one = ?

5. If the five other children should go into the house and leave the boy on the horse, how many children could then be seen? $6 - 5 = ?$ $6 - 1 = ?$

6. Can you show this and the other stories with splints?

7. How many children in the picture are riding?

8. How many are standing on the ground? $4 + 2 = ?$

9. If the two boys standing on the ground should walk away, how many children would be left with the hay?

10. If the boys and the girls that are riding should ride into the barn and leave the others outside, how many would be left? $6 - 4 = ?$ $6 - 2 = ?$

11. How many children are riding on the top of the hay?

12. How many other children are there? $3 + 3 = ?$

13. If the three children on top should hide in the hay, how many children could then be seen? $6 - 3 = ?$

14. How many pigeons are standing by the door of their house? How many are flying toward the house? How many are flying away?

15. Two and two and two are how many? Three twos = ?

Two and ***two*** and ***two*** are ***six***

$$2 + 2 + 2 = 6$$

16. How many windows are there in the front of the pigeon house? How many on the side? Two threes = ?

17. Take six splints and separate them as the birds are separated. How many twos do you find in six?

18. Separate six splints into equal groups of three. How many threes do you find in six?

19. If a number is divided into two equal parts, each part is called a *half*. What is a half of six? Of four?

10. Make stories for:

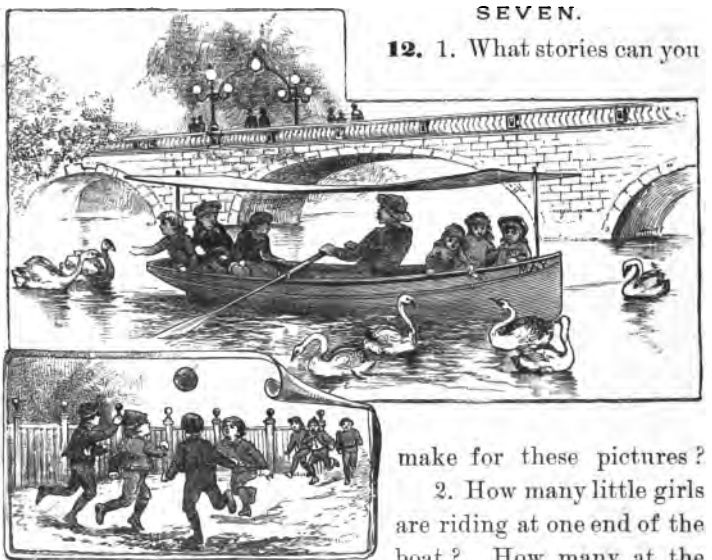
1. $4 + 2 = 6$. *2.* $3 + 3 = 6$. *3.* $6 - 3 = 3$. *4.* $6 - 2 = 4$.

11. Copy, and write the sums:

5	3	4	2	1
1	3	2	4	5

SEVEN.

12. 1. What stories can you



make for these pictures?

2. How many little girls are riding at one end of the boat? How many at the other end? Two threes are how many?

3. How many men are there in the boat? How many people in all are there in the boat? Six and one = ?

Six and ***one*** are ***seven.***

6 + 1 = 7

4. If the man should leave the children in the boat, how many would be left? Seven less one = ?

5. If all the little girls get out of the boat, how many people will be left in the boat? Seven less six = ?

7 − 6 = 1

6. Can you show with splints the answer to this and to the other questions?

7. How many swans are there in the picture?

8. How many swans are there at the right of the oar with which the man moves the boat? How many at the left?

9. Five and two are how many? Two and five = ?

10. How many swans are there near the little girl holding her hand over the end of the boat?

11. Are there other groups of two swans? How many?

12. Three twos are how many?

13. Three twos and one are how many?

14. If the little girl should frighten away the two swans at the left, how many swans would then be near the boat?

15. Seven less two are how many? 7 − 2 = ?

16. If these swans follow the boat, while the man with his oar frightens the others away, how many would be left near the boat? Seven less five are how many?

17. What are all the boys in the picture doing?

18. How many boys are there near the foot-ball? How many boys are running toward the foot-ball?

19. Four boys and three boys are how many boys?

20. Four and three are how many? Three and four = ?

Four and ***three*** are ***seven.***

+ = 7

21. Are there more girls at one end of the boat than at the other end of the boat?

22. In the game of foot-ball are there more boys near the ball than there are running toward it?

23. How many more boys are there near the ball than there are running toward it?

24. Four are how many more than three?

25. Four are how many more than four?

26. Count the glass globes over the bridge. How many groups of three are there?

27. Two threes are how many? How many threes are there in six? How many twos are there in six?

28. Two threes and one are how many?

29. Count the people on the bridge. How many are there? How many twos are there? How many threes are there?

30. Two twos are how many? Three twos are how many?

31. Two twos and three are how many?

13. Make stories for:

1. $6 + 1 = 7$. *2.* $5 + 2 = 7$. *3.* $7 - 5 = 2$. *4.* $7 - 3 = 4$.

14. Show with splints that:

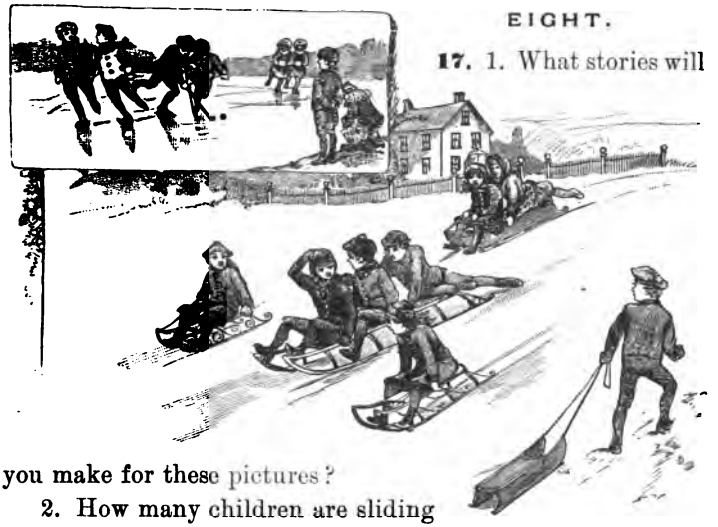
1. $6 + 1 = 7$. *4.* $1 + 6 = 7$. *7.* $7 - 1 = 6$. *10.* $7 - 6 = 1$.
2. $5 + 2 = 7$. *5.* $2 + 5 = 7$. *8.* $7 - 2 = 5$. *11.* $7 - 5 = 2$.
3. $4 + 3 = 7$. *6.* $3 + 4 = 7$. *9.* $7 - 3 = 4$. *12.* $7 - 4 = 3$.

15. Read the sums:

6	5	4	3	2	1	3	2
1	2	3	4	5	6	3	2
—	—	—	—	—	—	—	—

16. Copy and complete:

7	7	7	7	7
1	2	3	4	5
—	—	—	—	—
6	5	4	3	



EIGHT.

17. 1. What stories will you make for these pictures?

2. How many children are sliding down the hill on their sleds?

3. How many are walking up the hill?

4. Seven and one are how many? One and seven = ?

Seven and ***one*** are ***eight.***

7 + 1 = 8

5. Can you show with splints the answers to these questions?

6. How many boys are coasting? How many girls?

7. Six and two are how many? Two and six = ?

8. How many boys are there in the skating scene? How many girls?

9. Five and three are how many? Three and five = ?

10. How many little girls are skating together?

11. How many boys are playing with the ball on the ice?

12. How many other boys are skating together?

13. How many children are by the side of the ice?

14. How many twos are there in the skating scene ?

15. Four twos are how many ? Four times two = ?

16. How many children are at the left in the skating scene ? How many children are there at the right ?

17. Two fours are how many ? Two times four = ?

18. How many fours are there in eight ?

19. One-half of eight is how many ?

20. How much is one-half of six ? Of four ?

21. How many fence posts are there at the right of the house ? How many at the left ? How many in all ?

22. How many windows do you see in the front of the house ? How many at the side ? How many altogether ?

23. If the boy pulling the sled up the hill should go into the house, how many children would remain coasting ?

24. Eight less one are how many ?

$$8 - 1 = 7$$

25. If the seven coasters going down the hill should coast out of sight, how many coasters could then be seen ?

26. Eight less seven are how many ?

27. If the two girls that are coasting should go into the house, how many coasters would remain on the snow ?

28. Two from eight leaves how many ? Eight less two are how many ? 8 — 2 = ?

29. How many children are there in the skating scene ?

30. If the children that are skating should skate out of sight, how many children would then be seen ?

31. Eight less six are how many ? 8 — 6 = ?

32. If the three girls should go home and leave the boys at the pond, how many would be left ?

33. Eight less three are how many ? Eight less five = ?

34. If the girls take the boy standing by the pond with them, how many skaters will be left ?

35. Four from eight leaves how many? Eight less four = ?

36. Two twos and one are how many?

37. In the picture of the skaters, how many boys are there? How many girls? Are there more boys than girls? How many more?

38. How many boys are skating? How many girls? How many more boys than girls are skating?

39. How many more boys than girls are coasting?

40. If Charlie pays seven cents for a slate and one cent for a pencil, how much will he pay for both?

41. If Katie has six oranges and Anna has two, how many oranges have Katie and Anna together?

42. Frank's sled carried five boys down the hill and Henry's sled, three boys. How many boys did both carry?

18. Make stories for:

1. 7 + 1 = 8.	*3.* 5 + 3 = 8.	*5.* 8 − 1 = 7.	*7.* 8 − 3 = 5.
2. 6 + 2 = 8.	*4.* 4 + 4 = 8.	*6.* 8 − 6 = 2.	*8.* 8 − 4 = 4.

19. Show with splints that:

1. 7 + 1 = 8.	*4.* 4 + 4 = 8.	*7.* 8 − 1 = 7.	*10.* 8 − 7 = 1.
2. 6 + 2 = 8.	*5.* 2 + 6 = 8.	*8.* 8 − 2 = 6.	*11.* 8 − 6 = 2.
3. 5 + 3 = 8.	*6.* 3 + 5 = 8.	*9.* 8 − 3 = 5.	*12.* 8 − 5 = 3.

20. Read the sums:

7	6	5	4	3	2	1	0
1	2	3	4	5	6	7	8
—	—	—	—	—	—	—	—

21. Copy and complete:

8	8	8	8	8
7	6	5	4	3
—	—	—	—	—
1	2	3		

NINE.

22. 1. Can you tell a story

about the boys in this picture?

2. How many captains are there? How many lines of other soldiers are there? How many soldiers in each line?

3. Two fours are how many? Eight and one = ?

Eight and ***one*** are ***nine.***

$$8 + 1 = 9$$

4. In looking at the soldiers, what numbers do you see in nine? Answer: In nine I see two fours and a one.

5. In each group of birds, how many birds do you see?

6. Three threes are how many?

7. In nine how many threes do you see? Answer: In nine I see three threes.

8. If the drummer boys march together and the boys with flags and with guns march together, two and two, how many twos will there be?

9. If the captain should arrange his soldiers, two and two, what numbers would you see in nine? Answer: In nine I should see four twos and a one.

10. Take nine splints and separate them like the soldiers with their captain. What numbers have you now in nine?

11. Separate the nine splints as the birds are separated? What numbers have you now in nine?

12. If a number is divided into three equal parts, each part is called a *third*. What is a third of nine?

13. Separate the nine splints into twos. What numbers have you now in nine?

14. Make four straight marks together, thus: | | | | = 4
Under them make four other straight marks: | | | | = 4
Under these make one straight mark: | = 1
How many marks are there in all? 8 + 1 = ? 9

15. Make three groups of three marks each, | | | = 3
and tell how many there are in all. | | | = 3

16. How many drummer boys do you see in | | | = 3
the picture? How many other boys do you see? 9

17. Seven and two are how many? Two and seven = ?

18. How many birds are on the left of the trunk of the tree? How many are on the right? 6 + 3 = ? 3 + 6 = ?

19. How many of the soldiers are carrying guns? How many other soldiers are there? 4 + 5 = ? 5 + 4 = ?

20. What numbers do you see in nine, when you separate nine splints into groups of four? Of three? Of two?

21. Using nine splints, what two numbers can you see in nine? Answer: In nine I can see:

8	7	6	5
1	2	3	4

22. If the captain is frightened and runs away, how many soldiers will be left? 9 − 1 = ?

23. If the captain is brave, but all the others run away, how many will be left? $9 - 8 = ?$

24. If the two boys that are barefooted should go home, how many boys would remain? $9 - 2 = ?$ $9 - 7 = ?$

25. Should the three birds at the right of the tree fly away, how many birds would be left? $9 - 3 = ?$ $9 - 6 = ?$

26. If the soldiers with drums and those with flags should be wounded, how many would there be not wounded?

27. Hold up nine splints in the left hand. Take away one. How many remain?

28. How many splints will remain, if from nine splints you take two splints? Three? Four?

29. How many splints will remain, if from nine splints you take away five splints? Six? Seven? Eight?

23. Make stories for:

1. $8 + 1 = 9$.	*3.* $6 + 3 = 9$.	*5.* $9 - 8 = 1$.	*7.* $9 - 6 = 3$.
2. $7 + 2 = 9$.	*4.* $5 + 4 = 9$.	*6.* $9 - 2 = 7$.	*8.* $9 - 4 = 5$.

24. Show with splints that:

1. $8 + 1 = 9$.	*5.* $1 + 8 = 9$.	*9.* $9 - 1 = 8$.	*13.* $9 - 8 = 1$.
2. $7 + 2 = 9$.	*6.* $2 + 7 = 9$.	*10.* $9 - 2 = 7$.	*14.* $9 - 7 = 2$.
3. $6 + 3 = 9$.	*7.* $3 + 6 = 9$.	*11.* $9 - 3 = 6$.	*15.* $9 - 6 = 3$.
4. $5 + 4 = 9$.	*8.* $4 + 5 = 9$.	*12.* $9 - 4 = 5$.	*16.* $9 - 5 = 4$.

25. Read the sums:

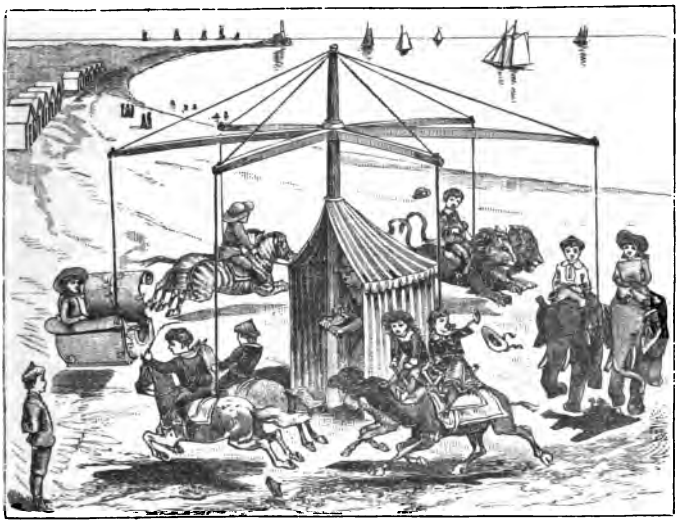
8	7	6	5	4	3	2	1
1	2	3	4	5	6	7	8
—	—	—	—	—	—	—	—

26. Copy, and write remainders:

9	9	9	9	9	9	9	9
1	2	3	4	5	6	7	8
—	—	—	—	—	—	—	—

TEN.

27. 1. What stories can you make for this picture ?



2. How many children are riding on the merry-go-round ?
3. How many are looking on ?
4. Nine and one are how many ? One and nine = ?

Nine and ***one*** are ***ten.***

9 + 1 = 10

5. How many children are riding on animals ?
6. How many other children do you see ?
7. Eight and two are how many ? Two and eight = ?
8. How many children have lost their hats ?
9. Seven and three are how many ? Three and seven = ?
10. How many little girls do you count in the picture ?
11. How many other children do you see ?
12. 6 + 4 = ? 4 + 6 = ?
13. How many bathers do you see in the water ?

14. How many people are standing on the beach ?

15. Five and five are how many ? Two fives = ?

16. Into what groups are the boats separated by the lighthouse ?

17. How many fives are there in ten ?

18. How much is a half of ten ? Of eight ? Of six ?

19. How many elephants do you see ? How many lions ? How many camels ?

20. How many animals are there in a pair of animals ?

21. How many pairs of animals do you see ? Five twos = ?

22. If the little boy looking at the others should go away, how many children would remain ?

23. One from ten leaves how many ? Nine from ten = ?

24. If the little girl riding in the chariot should get out and leave the rest riding, how many children would remain riding ?

25. Two from ten leaves how many ? Eight from ten = ?

26. $10 - 3 = ?$ $10 - 7 = ?$ $10 - 4 = ?$ $10 - 6 = ?$

27. How many fives are there in ten ? If from ten one five is taken away, how many will remain ?

28. How many twos are there in ten ?

29. If Frank has two five-cent pieces, how much money has he ? Two fives are how many ?

30. Henry had five two-cent pieces. How much money did he have ?

31. If Henry has five two-cent pieces and gives away one of them, how many cents will he have left ?

32. If each postage stamp costs two cents, how much will five cost ?

33. How many oranges at five cents each can you buy for ten cents ? How many fives are there in ten ?

34. How many postal cards at one cent each can you buy for ten cents ?

35. If two of the ten postal cards are sent away, how many will be left? $10 - 2 = ?$

36. How many apples at three cents each can you buy for nine cents? How many can you buy for ten cents?

37. If Jennie has nine cents and spends a third of it for an orange, how much does she spend?

38. How many threes are there in nine? How much is a third of nine? Of six? Of three?

28. Make stories for:

1. $8 + 2 = 10$. *3.* $6 + 4 = 10$. *5.* $10 - 2 = 8$. *7.* $10 - 6 = 4$.
2. $7 + 3 = 10$. *4.* $5 + 5 = 10$. *6.* $10 - 7 = 3$. *8.* $10 - 5 = 5$.

29. Read the sums:

8	7	6	5	4	3	2	1
2	3	4	5	6	7	8	9

30. Read the remainders:

10	10	10	10	10	10	10	10
2	3	4	5	6	7	8	9

31. Copy, and write the sums:

8	7	5	4	3
2	3	4	4	4

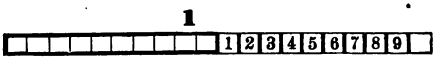
32. Copy, and write the remainders:

10	10	9	8	7
2	8	2	2	3

TEN TO TWENTY.

WRITING NUMBERS.

I. BY FIGURES.



33. Using a numeral frame, or splints, or other counters, take *one group* of ten counters. Take ten more of the same kind of counters. They are represented thus:

10 stands for **1** group of ten and **0** more.

11. Ten and one more are *eleven,* written . . 11.

12. Ten and two more are *twelve,* written . . 12.

13. Ten and three more are *thirteen,* written . 13.

14. Ten and four more are *fourteen,* written . 14.

15. Ten and five more are *fifteen,* written . . 15.

16. Ten and six more are *sixteen,* written . . 16.

17. Ten and seven more are *seventeen,* written 17.

18. Ten and eight more are *eighteen,* written . 18.

19. Ten and nine more are *nineteen,* written . 19.

20. Ten and ten more are *twenty,* written . . 20.

20 stands for **2** groups of ten and **0** more.

34. 1. In your left hand hold up the group of ten counters. In your right hand hold up so many (holding up 1, 2, 3, etc.) other counters.

2. How many counters have you in your left hand? How many in your right hand? In both hands?

3. Write the number of counters held in both hands.

4. Which figure stands for the group in your left hand? For the group in your right hand?

35. Show with counters the meaning of the following:

13, 15, 14, 16, 17, 12, 18, 11, 19, 10, 20.

36. Write with figures the following numbers:

1. Twelve.	4. Fifteen.	7. Twenty.
2. Sixteen.	5. Eighteen.	8. Fourteen.
3. Eleven.	6. Seventeen.	9. Nineteen.

II. BY LETTERS.

37. 1. The letter X, stands for a group of *ten;* V, for a group of *five;* I, for *one.*

2. The numbers 1 to 10 are written with letters. Thus,

I = 1.	II = 2.	III = 3.	IV = 4.	V = 5.
VI = 6.	VII = 7.	VIII = 8.	IX = 9.	X = 10.

I *before* V or X means 1 *less* than 5 or 10.

3. The numbers 11 to 20 are written by placing the numbers from 1 to 10 after X. Thus,

XI = 11.	XII = 12.	XIII = 13.	XIV = 14.	XV = 15.
XVI = 16.	XVII = 17.	XVIII = 18.	XIX = 19.	XX = 20.

4. What lesson in your book is Lesson I? V? IV? VI? X? XI? XV? XIV? XVI? XVIII? XIX?

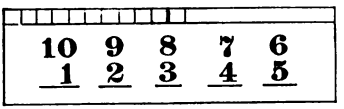
5. What time is it when the hour hand of the clock points to XI? IX? VI? III? VIII? XII?

38. Write with letters the following numbers:

1. Eight.	4. Four.	7. Nineteen.
2. Thirteen.	5. Nine.	8. Seventeen.
3. Eighteen.	6. Fourteen.	9. Twelve.

ELEVEN AND TWELVE.

11



39. Object Exercises.

1. With eleven counters, or eleven marks, what groups of two numbers can you find?

2. Besides ten and one, what other groups can you find in eleven?

3. How many are 9 + 2? 8 + 3? 7 + 4? 6 + 5?

4. What different groups of two numbers make eleven?

5. If in eleven there are ten and one, how many will be left if one is taken away? If ten are taken away?

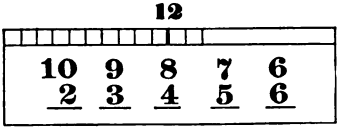
6. Since nine counters and two counters make eleven counters, how many counters will be left, if two are taken from eleven? If nine are taken from eleven?

7. In eleven you found eight and three. How many will be left then, after taking three from eleven? After taking eight from eleven?

8. Seven counters and four counters make eleven counters. Take four from eleven counters. How many are left? Take seven from eleven. How many are left?

9. Six and five make eleven. After taking six from eleven, how many are left? After taking five?

12



10. What different groups of two numbers can you find with twelve counters?

11. $10 + 2 = ?$ $9 + 3 = ?$ $8 + 4 = ?$ $7 + 5 = ?$

12. How many sixes do you find in twelve ?

13. One-half of twelve is how many ?

14. How many fours do you find in twelve ? One-third of twelve = ?

15. How many threes do you find in twelve ? One-fourth of twelve = ?

16. How many twos do you find in twelve ? How many twos in eleven ?

17. If from twelve counters you take six counters, how many counters will be left ?

18. After taking five counters from twelve counters, how many counters are left ? After taking seven counters ?

19. From twelve counters take four counters. How many are left ? From twelve counters take eight counters. How many are left ?

20. How many groups of four counters can you take from twelve counters ?

21. From twelve counters take three counters. How many are left ? Taking nine counters, how many remain ?

22. How many groups of three counters can you take from twelve counters ?

23. How many groups of two counters can you take from twelve counters ?

24. If a dozen, or twelve, oranges are divided equally between two boys, how many oranges will each boy receive ?

25. How many oranges will each boy receive, if a dozen oranges are equally divided among three boys ? Four boys ?

26. Two gloves make a pair of gloves. How many gloves are there in six pairs of gloves ?

27. Six twos are how many ?

28. One butterfly has four wings. How many wings have three butterflies ? Three fours are how many ?

40. Slate Exercises. I. **Copy, and write the sums:**

9	3	5	6	5	4	7	3
2	9	5	6	6	7	5	8
8	1	7	4	8	5	6	4
4	7	3	6	2	4	5	4
2	3	4	4	3	5	2	4
1	2	4	2	4	1	2	0
2	2	3	3	5	6	7	8

II. **Copy, and write the remainders:**

12	12	12	12	12	12	12	12
2	9	3	8	4	7	5	6
11	11	11	11	11	11	11	11
2	9	8	3	7	4	6	5

41. Oral Problems. 1. Henry had nine cents and earned two cents. How many cents did he then have?

2. Edward had eleven cents and spent two cents. How many cents did he have left?

3. Frank had eleven cents and spent nine cents. How many cents did he then have?

4. In one dish there are eight apples; in another, three apples. How many apples are there in both dishes?

5. If Susie has eleven oranges and Edith has eight oranges, how many more oranges has Susie than Edith?

6. Martha had eight pears, and her sister Jennie four pears. How many pears did both have? $8 + 4 = ?$

7. Four pears from twelve pears leaves how many pears?

8. George has seven cents. How many cents must he earn to have twelve cents? 7 from 12 = ? 5 from 12 = ?

9. Mary is seven years old. How old will she be in four years more? 4 + 7 = ? 7 + 4 = ?

10. John had eleven marbles and gave away four marbles. How many did he then have? 11 − 7 = ? 11 − 4 = ?

11. If John loses five of his eleven marbles, how many marbles will he have left? 6 + 5 = ? 11 − 6 = ? 11 − 5 = ?

12. How many legs have two beetles, if each beetle has six legs?

13. One-half of twelve is how many? One-third of twelve = ?

14. If Arthur has six tops and buys six more, how many tops will he then have? 12 + 6 = ?

15. If Arthur has twelve tops and he gives Thomas five tops, how many tops will he have left? If he gives away six tops, how many will he have left? If seven?

16. How much must Carrie pay for half a yard of ribbon, if it costs her twelve cents a yard?

17. If Jane buys a third of a dozen buttons, how much will they cost her at twelve cents a dozen?

42. Sight Exercises. I. **Read sums, or remainders, at sight:**

10	9	8	8	7
2	3	3	4	4

II. **Read sums at sight:**

1	2	3	2	3
2	2	3	4	0
3	2	3	3	5

THIRTEEN AND FOURTEEN.

13

10	9	8	7	6
3	4	5	6	7

43. Object Exercises.

1. Separate thirteen counters into two groups, one group containing ten counters. How many counters are there in the other group? Ten counters and three counters = ?

2. If three are taken from thirteen, how many remain? If ten are taken from thirteen, how many remain?

3. If the thirteen counters are divided into two groups, one of which contains nine counters, how many counters are there in the other group?

4. 9 + 4 = ?	4 + 9 = ?	*7.* 7 + 6 = ?	6 + 7 = ?
5. 13 − 4 = ?	13 − 9 = ?	*8.* 13 − 5 = ?	13 − 8 = ?
6. 8 + 5 = ?	5 + 8 = ?	*9.* 13 − 6 = ?	13 − 7 = ?

10. In fourteen what groups are there?

11. To what number is each of the following groups equal?

4	5	6	7	8	9
10	9	8	7	6	5

14

10	9	8	7	6
4	5	6	7	8

12. Since four and ten equal fourteen, what remains if four are taken from fourteen? 14 − 4 = ? 14 − 10 = ?

13. 5 + 9 = 14. 9 + 5 = 14. 14 − 5 = ? 14 − 9 = ?

14. Separate fourteen into sevens. How many sevens are there in fourteen? What is one-half of fourteen?

15. Separate fourteen into twos. How many twos are there in fourteen?

16. Separate fourteen into fives. How many fives are there in fourteen? How many remain besides the two fives?

17. Separate fourteen into threes. How many threes are there in fourteen? How many remain besides the four threes?

18. In fourteen, how many groups of four are there?

44. Slate Exercises. I. **Copy, and write the sums:**

9	9	4	3	9	8	6
5	4	9	9	2	4	6
—	—	—	—	—	—	—
5	6	6	6	7	7	6
5	5	6	7	6	7	8
—	—	—	—	—	—	—

II. **Copy, and write the remainders:**

14	14	14	12	13	13	13
7	6	8	6	6	7	8
—	—	—	—	—	—	—
10	11	11	11	10	11	11
5	5	6	2	2	3	4
—	—	—	—	—	—	—

45. Oral Problems. 1. Kate had fourteen cents and spent four cents. How many cents did she then have?

2. George earned seven cents one day and seven cents the next day. How much did he earn in both days?

3. Fannie had seven oranges and Tom had six oranges. How many oranges did they together have?

4. If Mr. Brown had thirteen dollars and spent seven dollars, how many dollars did he have left?

5. Edward is thirteen years old and John is eight years old. Which boy is the older, and how much?

6. Of fourteen children eight are boys. How many of them are girls?

7. Of fourteen children that were standing, six sat down. How many remained standing?

8. In a bag there were fourteen marbles. Howard took five of them out. How many marbles were left in the bag?

9. If Susie has nine buttons in a box and she puts in four more, how many buttons will she then have in the box?

10. If Susie has thirteen buttons in a box and she takes out nine buttons, how many buttons will be left in the box?

11. Mary is thirteen years old; her sister Jane, six. In how many years will Jane be as old as Mary now is?

12. How many blackberries are there in two clusters each containing seven blackberries?

13. One-half of fourteen is how many?

14. On one branch of a tree there grew eight apples; on another, six apples. How many apples grew on both branches?

15. If eight apples had grown on one branch and five on the other branch, how many apples would there have been on both branches?

46. Sight Exercises. I. **Read sums, or remainders, at sight:**

9	9	9	9	8
2	3	4	5	6
—	—	—	—	—

II. **Read remainders at sight:**

11	12	13	14	14
2	3	4	5	6
—	—	—	—	—

FIFTEEN AND SIXTEEN.

47. Object Exercises.

15

10	9	8	7	6
5	6	7	8	9

1. Separate fifteen counters into two groups of counters in as many ways as you can.

2. Seven splints and eight splints are how many splints? Seven and eight = ?

3. If from fifteen shells six shells are taken, how many shells are left?

4. If from fifteen shells nine shells are taken, how many shells are left? Nine shells and six shells are how many?

5. Separate fifteen into fives. How many fives are there in fifteen? One-third of fifteen is how many?

6. Separate fifteen into threes. How many threes are there in fifteen? One-fifth of fifteen is how many?

16

10	9	8	7	6
6	7	8	9	10

7. In sixteen what different groups do you find?

8. How many eights are there in sixteen? One-half of sixteen is how many?

9. Separate sixteen into fours. How many fours are there in sixteen? One-fourth of sixteen is how many?

10. If from sixteen counters eight are taken away, how many are left? 8 + 8 = ? 16 − 8 = ?

11. 7 + 9 = ? 9 + 7 = ? 16 − 7 = ? 16 − 9 = ?

12. From sixteen take one-fourth of sixteen. How many are left?

13. How many fives are there in sixteen? How many besides the three fives are there?

14. How many threes are there in sixteen? How many besides the five threes are there in sixteen?

15. How many twos do you find in sixteen counters?

48. Slate Exercises. I. **Copy, and write the sums:**

9	8	8	7	8	7	9
6	6	7	7	8	9	7
6	7	8	5	6	7	7
6	7	8	5	4	3	9

II. **Copy, and write the remainders:**

14	12	16	15	15	15	15
7	6	8	5	6	7	8
16	16	15	15	13	13	13
7	9	9	6	6	7	4

49. Oral Problems. 1. Matthew had three five-cent pieces. How much money did he have?

2. If Matthew spends five cents out of fifteen cents, how many cents will he have left?

3. If he spends two five-cent pieces out of fifteen cents, how many cents will he have left?

4. One-third of fifteen cents equals how many cents?

5. How many oranges at five cents each can be bought for fifteen cents?

6. If fifteen acorns are divided into three equal groups, how many acorns will there be in each group?

7. Five three-cent pieces are equal to how many cents?

8. A basket contained sixteen apples. After seven apples had been taken from it, how many were left in the basket?

9. If nine apples are taken from sixteen apples, how many apples will be left?

10. Morris had eight rabbits and Annie had seven rabbits. How many rabbits did both have?

11. If from fifteen rabbits seven are sold, how many rabbits will be left? $15 - 7 = ?$ $15 - 8 = ?$

12. If one kite costs eight cents, what will two kites cost?

13. What will be the cost of four slates at four cents each?

14. If three slates cost fifteen cents, and one of them cost six cents, how much do the other two slates cost? $15 - 9 = ?$ $15 - 6 = ?$

15. Fred had sixteen cents and spent one-half of his money for candy. How much money did he have left?

16. How many dolls at four cents each can Edith buy for sixteen cents?

17. How old will Tillie be in seven years, if she is nine years old now?

50. Sight Exercises. I. **Read sums at sight:**

8	8	7	6	7
8	7	8	9	9

II. **Read remainders at sight:**

16	15	15	16	15
7	8	7	9	6

SEVENTEEN AND EIGHTEEN.

17

10	9	8	7	6
7	8	9	10	11

51. Object Exercises.

1. In seventeen counters, what groups do you find?

2. 10 + 7 = ? 7 + 10 = ?

3. 9 + 8 = ? 8 + 9 = ?

4. Seventeen less seven are how many? 17 − 10 = ?

18

10	9	8	7	6
8	9	10	11	12

5. 17 − 8 = ? 17 − 9 = ?

6. With eighteen counters, what groups can you make?

7. 10 + 8 = ? 9 + 9 = ?

8. 18 − 8 = ? 18 − 10 = ?

9. Eighteen less nine are how many? 18 − 9 = ?

10. How many nines are there in eighteen? One-half of eighteen is how many? Of sixteen? Of fourteen?

11. How many sixes are there in eighteen? One-third of eighteen is how many? Of fifteen? Of twelve?

12. In eighteen there are how many threes? Twos?

13. How many fours are there in eighteen? In seventeen?

14. How many fives are there in eighteen? In seventeen?

52. Slate Exercises. I. **Copy, and write the sums:**

9	8	8	9	7	7	8
8	9	8	9	7	8	7
—	—	—	—	—	—	—
7	6	6	6	7	5	5
7	6	7	6	6	5	6
—	—	—	—	—	—	—
1	2	3	3	4	5	9
2	3	3	4	3	5	1
3	4	3	5	6	7	8
—	—	—	—	—	—	—

II. **Copy, and write the remainders:**

18	16	14	16	10	8	6
9	8	7	6	5	4	3
16	16	16	17	17	18	15
7	8	9	8	9	9	7

53. Oral Problems. 1. Carl spent ten cents for paper, five cents for envelopes, and two cents for a postage stamp How much money did he spend ?

2. If Edward has seventeen cents and buys three tops at five cents each, how many cents will he have left ?

3. Jane had one bunch of nine grapes and another of eight grapes. How many grapes did she have altogether ?

4. Thomas had three five-cent pieces and three one-cent pieces. How much money did he have ?

5. How much will six newspapers cost at three cents each ?

6. In a nest there were seventeen eggs ; after eight eggs were taken away, how many eggs were left ?

7. If nine eggs are taken out of a nest containing seventeen eggs, how many will be left ?

8. If half of the eggs in a nest containing eighteen eggs are taken out, how many will be left ?

9. A daffodil has six petals. How many petals have three daffodils ?

10. How many pears at three cents each can be bought for eighteen cents ?

11. If eighteen cents are equally divided among three little girls, how many cents would each little girl receive ?

12. A grocer had eighteen bananas in a bunch. He sold one-third of them. How many did he have left?

13. If the grocer had fifteen bananas and sold one-third of them, how many would he have left?

14. At six cents each, three writing-books cost how much?

15. How much will nine newspapers cost at two cents each? Four at three cents and five at one cent each?

16. If Fred pays two car-fares, five cents each, and has seven cents left, how much money did he have at first?

17. Edward had seventeen cents and he bought three masks at five cents each. How much money did he have left?

18. Ten cents and seven cents are how many cents?

Ten cents and ***seven cents*** are ***seventeen cents.***

10 ¢ + 7 ¢ = 17 ¢

54. Sight Exercises. I. **Read sums at sight:**

9 ¢	9 ¢	8 ¢	8 ¢	7 ¢
9	8	8	7	8

2	4	3	8	9
4	4	5	4	0
6	4	7	4	7

II. **Read remainders at sight:**

17 ¢	18 ¢	17 ¢	15 ¢	13 ¢
8	9	9	6	4

NINETEEN AND TWENTY.

55. Object Exercises.

19

10	9	8	7	6
9	10	11	12	13

1. Separating nineteen counters into two groups, one of which contains ten counters, how many counters will there be in the other group? Ten and nine are how many?

2. What other groups can you find in nineteen counters? How many counters besides the two groups of nine do you find in nineteen counters?

3. How many groups of six can you find in nineteen? Of five? Of four? Of three? Of two?

4. Take two from nineteen; and two from the remainder, and so on, stating each time how many are left.

5. How many are left if from nineteen counters nine counters are taken? Eight? Seven? Six? Five? Four? Three? Two?

20

10	9	8	7	6
10	11	12	13	14

6. How many groups of ten do you find in twenty? Of nine? Of eight? Of seven? Of six? Of five? Of four? Of three? Of two?

7. Take two from twenty, and two from the remainder, and so on, stating each time how many are left.

8. How many are left if from twenty counters ten are taken? Nine? Eight? Seven? Six? Five? Four? Three? Two?

9. Two tens are how many? Ten twos are how many?

10. Four fives are how many? Five fours are how many?

11. How much is one-half of twenty? One-fourth?

56. Count by twos, fours, fives from 0 to 20.

57. Count by twos, fours, fives from 20 to 0.

58. Slate Exercises. I. **Copy, and write the sums:**

9	8	7	6	5	4	3
9	8	7	6	5	4	3
9	8	7	6	5	4	3
8	7	6	5	4	3	2
4	5	6	7	8	6	9
4	5	4	1	0	6	2
4	5	5	7	8	5	9

II. **Copy, and write the remainders:**

18	16	14	12	10	8	6
9	8	7	6	5	4	3
18	16	14	12	10	8	6
10	9	8	7	6	5	4
18	16	14	12	10	8	6
8	7	6	5	4	3	2

59. Oral Problems. 1. A dime is equal to ten cents. To how many cents are two dimes equal?

2. Mr. Taft gave twenty cents to two boys. Each boy received one-half of the sum. How much money did each boy receive?

3. Two dimes equal how many nickels or five-cent pieces?

4. If four balls cost twenty cents, how much does one ball cost ?

5. If a yard of ribbon costs twenty cents, what will half of a yard cost ? What will a quarter of a yard cost ?

6. When eggs sell for four cents apiece, what will five eggs cost ?

7. What is the cost of four oranges at five cents each ? Of two melons at ten cents each ? Of ten apples at two cents each ?

8. Martha had nineteen cents and spent nine cents for ribbon. How much did she have left ?

9. Sarah had nineteen cents and bought three yards of lace at six cents a yard. How many cents did she have left ?

10. Frank had two dimes and bought six papers at three cents each. How much money did he have left ?

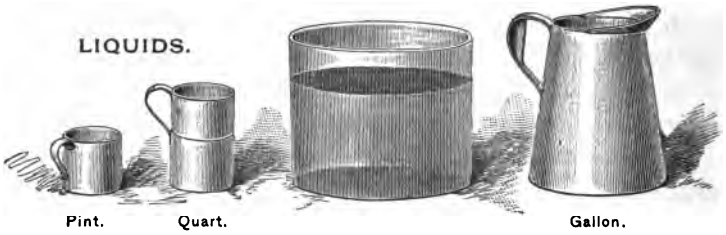
11. George had three five-cent pieces, and two two-cent pieces. How much money did he have ?

60. Sight Exercises. I. **Read sums at sight:**

10 ¢	9 ¢	8 ¢	7 ¢	6 ¢
10	9	8	7	6
10	9	8	7	6
9	8	7	6	5

II. **Read remainders at sight:**

20 ¢	18 ¢	16 ¢	14 ¢	12 ¢
10	9	8	7	6



2 Pints make 1 Quart. 4 Quarts make 1 Gallon.

61. 1. Can you name some of the measures by which milk, vinegar, and other liquids are bought and sold ?

2. Take a pint measure and fill it with water. Pour the water from the pint measure into the quart measure. How nearly full is the quart measure ?

3. If you pour another pint of water into the quart measure, how nearly full will the quart measure be ?

4. How many pints make a quart ?

5. How many quarts of water will it take to fill a gallon measure ? How many pints ?

6. In a gallon how many quarts are there ? How many pints ?

7. If milk sells for eight cents a quart, how much will a pint cost ? Three pints ?

8. At ten cents a quart, how much will three pints of cider vinegar cost ?

9. If a gallon of oil costs sixteen cents, how much will a quart cost ? Two quarts ? Half a gallon ?

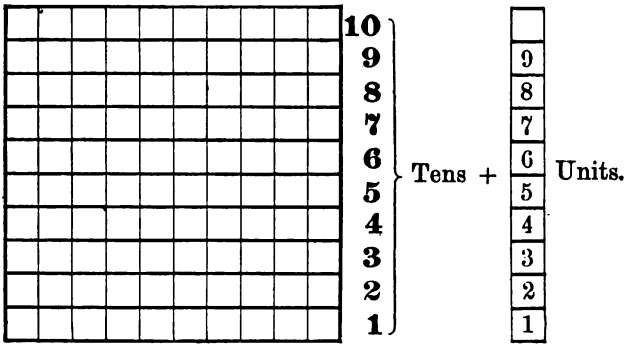
10. How much will half a gallon of syrup cost, if a pint costs five cents ?

62. Find the cost :

1. 2 quarts at 3 ¢ a pint.
2. 3 pints at 8 ¢ a quart.
3. Half-a-gallon at 4 ¢ a pint.
4. 3 quarts at 20 ¢ a gallon.

TWENTY TO ONE HUNDRED.

WRITING NUMBERS.



I. BY FIGURES.

63. 1. How many single ones or units are there in each of the above lines or groups of squares ?

2. How many groups of ten squares are there ?

3. How many groups of ***ten*** are there in **10** ? In **20** ?

64. In the same manner:

30 stands for *three tens,* or *thirty,* written . . 30

40 stands for *four tens,* or *forty,* written . . . 40

50 stands for *five tens,* or *fifty,* written . . . 50

60 stands for *six tens,* or *sixty,* written . . . 60

70 stands for *seven tens,* or *seventy,* written . . 70

80 stands for *eight tens,* or *eighty,* written . . 80

90 stands for *nine tens,* or *ninety,* written . . 90

100 stands for *ten tens,* or *one hundred,* written 100

65. Show by the diagram that:

	Tens. Units.		Tens. Units.
21, *twenty-one,*	= **2** + **1**.	**65,** *sixty-five,*	= **6** + **5**.
33, *thirty-three,*	= **3** + **3**.	**78,** *seventy-eight,*	= **7** + **8**.
42, *forty-two,*	= **4** + **2**.	**86,** *eighty-six,*	= **8** + **6**.
54, *fifty-four,*	= **5** + **4**.	**97,** *ninety-seven,*	= **9** + **7**.

66. Read and show the meaning of the following:

22, 25, 38	42, 46, 49	66, 69, 71
31, 33, 37	51, 55, 56	75, 88, 96

67. Write from dictation:

73, 64	27, 35	57, 71	92, 85
82, 91	42, 18	63, 49	78, 99

II. BY LETTERS.

68. What numbers of units do the following letters represent?

I II III IV V VI VII VIII IX X

69. The tens are represented as follows:

X	XX	XXX	XL	L	LX	LXX	LXXX	XC	C
10	20	30	40	50	60	70	80	90	100.

70. In writing any number from one to one hundred, the letters representing the tens, if any, are written first. Thus:

XXII = 22	XLI = 41	LXXV = 75
XXXIV = 34	XLVI = 46	XCIX = 99

71. Read the following numbers:

IX.	XVI.	XXIV.	XLVI.	LXVIII.	XCV.
XIX.	XXVI.	XXXIV.	XLIX.	LXXXIX.	XCVII.

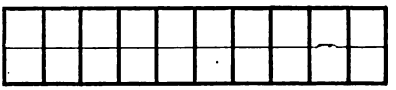
72. Write with letters the following from dictation:

23, 53	36, 56	55, 66	71, 92
42, 64	47, 62	33, 49	84, 98

EQUAL GROUPS.

73. 1. Into how many equal groups of two did you divide ten counters?

10 × 2



2. Separate twenty counters into groups of two. How many groups of two are there in twenty?

2	2	2	2	2	2	2	2	2	2
1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20

3. How many counters are there in two of the groups? Two twos are how many?

4. How many counters are there in three of the groups? Three twos are how many?

5. Three times two are how many?

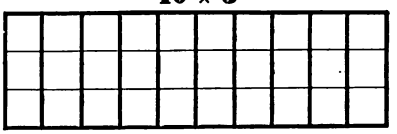
Three times ***two*** are ***six.***

3 × 2 = 6

6. Find the number of counters in four twos? In five twos?

7. Six twos = ? Seven twos = ? Eight twos = ? Nine twos = ? Ten twos = ? Two tens = ?

10 × 3



8. Ten threes are how many? Three tens are how many?

3	3	3	3	3	3	3	3	3	3
1	2	3	4	5	6	7	8	9	10
3	6	9	12	15	18	21	24	27	30

9. Two threes are how many? Three threes are how many? Four threes = ?

10. If twelve counters are arranged in groups of three, how many groups will there be? Four threes = ?

11. Five threes = ? Six threes = ? Seven threes = ? Eight threes = ? Nine threes = ? Ten threes = ?

74. Copy the diagram and the table of 2 and of 3.

75. Copy, and show by the diagram that:

3 =	1 × 3 = 3
3 + 3 =	2 × 3 = 6
3 + 3 + 3 =	3 × 3 = 9
3 + 3 + 3 + 3 =	4 × 3 = 12
3 + 3 + 3 + 3 + 3 =	5 × 3 = 15
3 + 3 + 3 + 3 + 3 + 3 =	6 × 3 = 18
3 + 3 + 3 + 3 + 3 + 3 + 3 =	7 × 3 = 21
3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 =	8 × 3 = 24
3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 =	9 × 3 = 27
3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 =	10 × 3 = 30

NOTE.—Teachers that prefer to do so, may here teach also how many 3's there are in 3, 6, 9, 12, etc. ; when 4's are grouped, how many 4's, etc.

76. Let the pupil construct similar tables for 4, 5, 6, etc., in the grouping of each of these numbers.

ORAL PROBLEMS.

77. 1. If one orange costs two cents, how much will two oranges cost ?

2. How much will three oranges cost at two cents each ?

3. How much will eight oranges cost at two cents each ?

4. How many are ten twos ? How many are two tens ? Which is the greater, two tens or ten twos ?

5. What will five pears at three cents each cost ?

6. If one hat costs three dollars, what will six hats cost ?

7. In one row there are three desks, how many desks are there in seven such rows ?

8. Charles worked eight weeks for three dollars a week. How much money did he earn in the eight weeks ?

9. If on each wagon there were three barrels of flour, how many barrels of flour would there be on nine wagons ?

WRITTEN PROBLEMS.

78. 1. If a cloak costs thirty-five dollars and a dress thirteen dollars, how many dollars will both cost?

Five dollars and ***three dollars*** are ***eight dollars.***

$5 + $3 = $8

SLATE

$35	$48
13	13
$48	$35

2. If Mrs. Thompson has forty-eight dollars and spends thirteen dollars for a dress, how many dollars will she have left? $48 − $13 = ?

3. If Anna pays twenty-five cents for writing paper and twelve cents for pencils, how much does she pay for all?

4. Carrie had seventy-eight cents and spent sixteen cents for a book. How many cents did she have left?

5. If Matthew has three dimes, or ten-cent pieces, and three five-cent pieces, how much money has he?

6. If Matthew has forty-five cents and spends twenty-four cents, how many cents will he have left? 45 ¢ − 24 ¢ = ?

79. Copy, and find the sums:

$25	$34	$43	$56	$65	$72	$81	$94
23	13	31	23	32	15	18	5
—	—	—	—	—	—	—	—
14	23	41	35	52	60	43	23
21	15	32	12	23	14	24	14
32	41	15	22	21	15	11	31
—	—	—	—	—	—	—	—

80. Copy, and find the remainders:

$48	$27	$56	$79	65 ¢	74 ¢	96 ¢	87 ¢
23	14	35	45	32	42	73	56
—	—	—	—	—	—	—	—

81. Copy, and write the sums:

4	14	24	34	44	54	64	74	84	94
1	1	1	1	1	1	1	1	1	1
—	—	—	—	—	—	—	—	—	—
4	14	24	34	44	54	64	74	84	94
2	2	2	2	2	2	2	2	2	2
—	—	—	—	—	—	—	—	—	—
4	14	24	34	44	54	64	74	84	94
3	3	3	3	3	3	3	3	3	3
—	—	—	—	—	—	—	—	—	—
4	14	24	34	44	54	64	74	84	94
4	4	4	4	4	4	4	4	4	4
—	—	—	—	—	—	—	—	—	—
4	14	24	34	44	54	64	74	84	94
5	5	5	5	5	5	5	5	5	5
—	—	—	—	—	—	—	—	—	—
4	14	24	34	44	54	64	74	84	94
6	6	6	6	6	6	6	6	6	6
—	—	—	—	—	—	—	—	—	—
4	14	24	34	44	54	64	74	84	94
7	7	7	7	7	7	7	7	7	7
—	—	—	—	—	—	—	—	—	—
4	14	24	34	44	54	64	74	84	94
8	8	8	8	8	8	8	8	8	8
—	—	—	—	—	—	—	—	—	—
4	14	24	34	44	54	64	74	84	94
9	9	9	9	9	9	9	9	9	9
—	—	—	—	—	—	—	—	—	—
4	14	24	34	44	54	64	74	84	94
10	10	10	10	10	10	10	10	10	10
—	—	—	—	—	—	—	—	—	—

82. The preceding is a model for a series of exercises for the slate or for sight reading. Make other similar exercises by substituting other numbers for 4, 14, 24, etc., as 1, 11, 21, etc.; 2, 12, 22, etc.; 3, 13, 23, etc.; 5, 15, 25, etc.

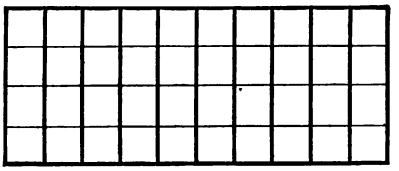
83. In these and subsequent sight exercises, pupils should read the answers: 1. From left to right; 2. From right to left; 3. From top to bottom; 4. From bottom to top; 5. As otherwise directed by the teacher.

NOTE.—Sight exercises may be read from the book or from the blackboard.

EQUAL GROUPS.

84. 1. If Howard pays four cents for one top, how much will two tops cost him? Three tops? Four tops?

10 × 4



4	4	4	4	4	4	4	4	4	4
1	2	3	4	5	6	7	8	9	10
4	8	12	16	20	24	28	32	36	40

2. Mamie had four books on each of four book-shelves. How many books in all did she have?

3. If Jane spends four hours in school each day, how many hours in school will she spend in five days?

4. Harold is four years old. His mamma is six times as old as he. How old is his mamma?

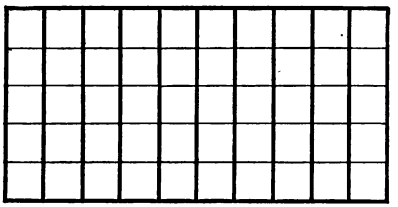
5. John ate four oranges every day for a week. How many oranges did he eat in the week, or seven days?

6. Francis saw eight wagons each drawn by four horses. How many horses in all did he see drawing the wagons?

7. How much must Edgar pay for ten slates at four cents each? For nine slates?

8. If there are five desks in one row, how many desks are there in two rows? In three rows?

10 × 5



5	5	5	5	5	5	5	5	5	5
1	2	3	4	5	6	7	8	9	10
5	10	15	20	25	30	35	40	45	50

9. How many desks are there in four rows each containing five desks? In five rows, each containing four desks?

10. At five cents each, how much will it cost for five persons to ride in a street-car?

11. If one silk hat costs five dollars, how much will six silk hats cost?

12. If each silk hat costs six dollars, what will five cost?

13. How much money has Edward, when he has seven nickels or five-cent pieces?

14. In each of seven boats there are five men. How many men altogether are there in the seven boats?

15. In an orchard there are eight rows of trees each containing five trees. How many trees are there in the orchard?

16. If a spool of silk costs five cents, how much will ten spools cost? At five cents each what will nine spools cost?

17. Is 7 × 3 more or less than 5 × 4? How much?

18. How much is 9 × 3 less than 7 × 4?

19. What is the sum of 4 × 4 and 3 × 3?

85. Copy the diagrams and tables for 4 and 5. Also construct other tables after the model in Art. 75.

WRITTEN PROBLEMS.

86. 1. If a silk dress costs forty-seven dollars and a shawl sixteen dollars, how much will both cost?

6 and 7 are 13, or 1 ten and 3 units; write 3 under the units, and add the 1 ten with the tens. 1 ten and 1 ten and 4 tens are 6 tens; write 6 under the tens, and place the dollar mark before it. Answer, $63.

SLATE

$47	$63
16	16
$63	$47

2. If Mrs. Burns has sixty-three dollars and spends sixteen dollars for a shawl, how many dollars will she have left?

6 cannot be taken from 3; take 1 ten from the 6 tens, leaving 5 tens; change the 1 ten to units, giving 10 units; 10 units and 3 units are 13 units. 6 from 13 leaves 7; write 7 under the units. 1 ten from 5 tens leaves 4 tens; write 4 under the tens, and place the dollar mark before it. Answer, $47.

3. If there are forty-seven horses in one pasture and fourteen in another, how many horses are there in both pastures?

4. If fourteen horses are taken out of a pasture containing fifty-one horses, how many horses will be left?

5. What will be the cost of a pair of vases, thirty-six dollars, and a clock, sixteen dollars?

6. If Mr. Edwards has five ten-dollar bills and three silver dollars and spends twenty-six dollars, how many dollars will he have left?

7. A newsboy had forty-seven cents and received seventeen cents more. How many cents did he then have?

8. If Fred has fifty-four cents and spends thirty-five cents, how many cents will he have left?

9. Henry earns forty-four dollars per month. How much will he have left, if he spends twenty-seven dollars?

10. Mr. Cameron paid forty-eight cents for a chicken and seventeen cents for corn. How much did he pay for both?

11. If Mr. Harris has fifty-five dollars and spends seventeen dollars, how much money will he have left?

12. In a cash drawer there were forty-nine dollars in bills and twenty-seven dollars in small coins. How much money in all was there?

13. If twenty-seven feet of pole are cut from a flag-pole fifty-six feet long, how long will it be?

87. Copy, and find the sums:

$32	$25	$53	$42	$64	$36	$71	$56
29	36	29	39	28	27	19	38
—	—	—	—	—	—	—	—
13	24	12	34	25	33	44	26
38	15	39	16	24	14	15	17
22	23	24	15	15	25	24	32
—	—	—	—	—	—	—	—

88. Copy, and find the remainders:

$32	$43	$55	$24	$42	$63	$75	$86
15	26	37	17	26	39	49	57
—	—	—	—	—	—	—	—
47 ¢	38 ¢	56 ¢	71 ¢	85 ¢	39 ¢	64 ¢	58 ¢
28	19	37	38	26	19	38	49
—	—	—	—	—	—	—	—

EQUAL GROUPS.

89. Construct a diagram for groups of 6.

90. Show by diagram and table (Art. 75) that:

2 × 6 = 12.	5 × 6 = 30.	8 × 6 = 48.
3 × 6 = 18.	6 × 6 = 36.	9 × 6 = 54.
4 × 6 = 24.	7 × 6 = 42.	10 × 6 = 60.

91. Copy, and commit to memory the following table:

6	6	6	6	6	6	6	6	6	6
1	2	3	4	5	6	7	8	9	10
6	12	18	24	30	36	42	48	54	60

92. Construct the corresponding diagram and tables for 7.

ORAL PROBLEMS.

93. 1. How much do six yards of ribbon cost at six cents a yard? $6 \times 6 = ?$

2. What will five papers of pins cost at six cents a paper?

3. Walter worked six days in each week. How many days did he work in seven weeks? $7 \times 6 = ?$

4. If Albert earns six dollars a week, how much will he earn in eight weeks? $8 \times 6 = ?$

5. If in each dish there are six oranges, how many oranges are there in eight dishes?

6. If one chair costs six dollars, how much will ten chairs cost? How much will nine cost?

7. Edgar is seven years old. His sister Emma is twice as old. How old is Emma? $2 \times 7 = ?$

8. In one week there are seven days. How many days are there in three weeks? In four weeks?

9. If one coat costs seven dollars, how much will five coats cost? $5 \times 7 = ?$

10. In one package there are seven pounds of sugar. How many pounds of sugar are there in six such packages?

11. If Mr. Kelly spends a dollar a day for his board, how much will he spend for board in eight weeks?

12. What will be the cost of ten barrels of flour at seven dollars a barrel? Of nine barrels?

13. How much will nine yards of lace cost at six cents a yard? At seven cents?

SIGHT EXERCISES.

94. Read sums at sight:

4	3	3	7	2	3	5	6	6	5
1	2	0	0	5	2	0	1	2	6
6	5	7	3	3	5	5	6	6	3
3	2	4	4	5	6	3	4	8	6
4	6	4	6	6	5	6	7	8	7
5	8	4	8	7	7	9	8	3	8

95. Read remainders at sight:

10	11	12	13	14	15	16	17	18	19
9	9	9	9	9	9	9	9	9	9
10	11	12	13	14	15	16	17	18	19
8	8	8	8	8	8	8	8	8	8

EQUAL GROUPS.

96. Construct a diagram for groups of 8.

97. Show by diagram and table that:

$2 \times 8 = 16.$	$5 \times 8 = 40.$	$8 \times 8 = 64.$
$3 \times 8 = 24.$	$6 \times 8 = 48.$	$9 \times 8 = 72.$
$4 \times 8 = 32.$	$7 \times 8 = 56.$	$10 \times 8 = 80.$

98. Copy, and commit to memory the following table:

8	8	8	8	8	8	8	8	8	8
1	2	3	4	5	6	7	8	9	10
8	16	24	32	40	48	56	64	72	80

99. Construct the corresponding diagram and tables for 9.

ORAL PROBLEMS.

100. 1. In each of four rows of houses there are eight houses. How many houses are there in all ?

2. How many pupils are there in a class seated in five rows, eight pupils in a row ? $5 \times 8 = ?$

3. If Hannah pays eight cents for one yard of calico, how many cents will she pay for six yards ?

4. In one peck there are eight quarts. How many quarts are there in seven pecks ? $7 \times 8 = ?$ $8 \times 7 = ?$

5. If each railroad car has eight wheels, how many wheels have eight cars ?

6. How many peaches are there on nine branches of a peach tree, if on each branch there are eight peaches ?

7. If a copy book costs nine cents, how much will ten copy books cost ?

8. How much will nine copy books cost at nine cents each ? At eight cents each ? $9 \times 9 = ?$

9. Henry is nine years old. His father is seven times as old. How old is the father ? $7 \times 9 = ?$ $9 \times 7 = ?$

10. William earns nine dollars a week. How much does he earn in six weeks ? $6 \times 9 = ?$ $9 \times 6 = ?$

11. In five weeks how much will William earn at nine dollars per week ?

12. In four baseball nines, how many boys are there ? In three ? $4 \times 9 = ?$ $9 \times 4 = ?$

13. There are four quarts in a gallon. How many quarts are there in nine gallons ?

14. Four pecks make a bushel. How many pecks are there in eight bushels ?

15. If each clover head has four leaves, how many leaves have nine clover heads ?

16. How much is 7×9 less than 8×8 ?

SIGHT EXERCISES.

101. Read sums at sight:

5	4	6	2	7	3	9	3	3	9
5	5	6	6	0	7	5	6	4	3
5	6	5	8	9	6	2	9	8	4
6	5	9	8	7	3	8	4	8	9
6	7	0	1	7	8	3	9	8	9
6	8	9	9	7	7	7	7	8	9

102. Read remainders at sight:

16	13	17	12	14	18	15	11	11	12
9	9	9	9	9	9	9	9	8	8
18	17	15	14	19	13	13	12	15	15
8	8	6	5	9	4	8	9	7	8

EQUAL GROUPS.

103. Construct a diagram for groups of 10.

104. Show by diagram and table that:

$2 \times 10 = 20.$	$5 \times 10 = 50.$	$8 \times 10 = 80.$
$3 \times 10 = 30.$	$6 \times 10 = 60.$	$9 \times 10 = 90.$
$4 \times 10 = 40.$	$7 \times 10 = 70.$	$10 \times 10 = 100.$

105. Copy, and commit to memory the following table:

10	10	10	10	10	10	10	10	10	10
1	2	3	4	5	6	7	8	9	10
10	20	30	40	50	60	70	80	90	100

ORAL PROBLEMS.

106. 1. If Frank pays ten cents for one musk-melon, how much will five musk-melons cost him ?

2. How many boys are sitting in four rows of desks, if in each row there are ten boys sitting ?

3. Charles travelled by steamboat ten miles an hour. How far did he travel in eight hours ?

4. Six men received each ten dollars for their week's work. How many dollars did they all receive ? At the same rate, how much would nine men receive ?

5. In each of nine rolls of muslin there were ten yards. How many yards were there in the nine rolls together ?

6. How much does Nellie pay for ten quarts of berries at six cents each ?

7. Edgar worked ten hours a day for five days. How many hours in all did he work ?

8. Mr. Henry bought five bottles of ink at ten cents each. How much did he pay for the five bottles ?

9. Margaret divided thirty cents equally among three children. How much did each child receive ?

SIGHT EXERCISES.

107. Read sums at sight:

5	4	2	1	5	7	8	6	9	4
5	5	7	9	4	8	3	7	1	8
6	6	0	8	9	3	6	0	5	5
8	7	9	5	8	1	7	8	4	6
3	8	8	7	7	9	8	7	3	9
2	3	4	4	0	8	2	7	7	9
9	9	8	9	6	4	9	7	8	9

Thus : 11, 14, 22, 28, 38 ; etc. Read also to the right, thus : 9, 11, 12, 17 ; etc.

108. Read remainders at sight:

19	18	17	16	15	14	13	12	12	13
9	9	9	9	9	9	9	9	8	8
14	15	16	16	15	14	13	12	12	13
8	8	8	7	7	7	7	7	6	6

WRITTEN PROBLEMS.

109. 1. If one Second Reader costs twenty-four cents, how much will three cost?

SLATE

24¢	
24	24¢
24	3
72¢	72¢

The Readers will cost 3 times 24 ¢. 3 times 4 are 12, or 1 ten and 2 units; write 2 under the units with the cent mark after it. 3 times 2 tens are 6 tens, which with the 1 ten make 7 tens; write 7 under the tens. Answer, 72 ¢.

2. Mr. Edwards sold forty-eight sheep to each of two men. How many sheep did he sell to both men?

3. If Mr. James has thirty-two cows in each of three pastures, how many cows will he have in all?

4. Mr. Samuels has thirty-four fish on each of three counters. How many fish in all has he?

5. George had eighteen cents and earned fifty-nine cents. How many cents did he then have?

6. If George had thirty-eight cents and earned twenty-nine cents, how many cents did he have?

7. Matthew travelled twenty-nine miles an hour by railroad. How far did he travel in two hours? In three hours?

8. If Matthew had forty-eight dollars and spent thirty-nine dollars, how many dollars did he have left?

9. Charles had forty-seven dollars and spent twenty-eight dollars. How many dollars did he then have?

10. Mrs. Baker had a piece of muslin containing thirty-seven yards. How many yards were left in the piece after she cut off eighteen yards?

11. What will be the cost of five yards of cloth at thirteen cents a yard? At fifteen cents?

12. If a man earns twenty-six dollars a week, how much will he earn in three weeks?

13. What must be paid for six yards of cloth, if each yard costs thirteen cents? For seven yards?

110. Copy, and find the sums:

17	25	15	47	52	34	26	65
28	13	22	26	27	27	18	15
31	44	43	13	18	18	26	19
—	—	—	—	—	—	—	—
28	19	37	16	23	19	38	35
17	27	18	47	32	38	16	17
26	36	25	29	27	37	27	29
—	—	—	—	—	—	—	—

111. Copy, and find the remainders:

37	46	37	58	73	81	55	62
18	28	19	38	35	37	48	29
—	—	—	—	—	—	—	—

112. Copy, and find the products:

23	37	44	33	27	18	25	32
4	2	2	3	3	4	3	3
—	—	—	—	—	—	—	—
17	21	16	15	14	13	12	26
4	4	6	5	4	4	8	3
—	—	—	—	—	—	—	—

2 Pints make **1 Quart. 8 Quarts** make **1 Peck. 4 Pecks** make **1 Bushel.**

113. 1. In what measures are vegetables, fruits, grains, seeds, etc., bought and sold ?

2. How many pints of chestnuts will it take to fill a quart measure ?

3. How many quarts of plums will make half a peck ?

4. In a ***small measure*** (one-quarter of a peck) of currants, how many quarts are there ?

5. A bushel of potatoes costs eighty cents. How much will a peck cost ?

6. If a pint of blackberries sells for three cents, how much will a peck sell for ?

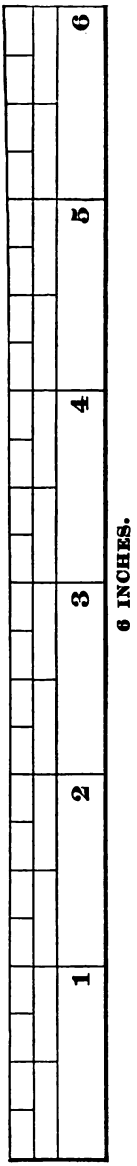
7. When roasted pea-nuts sell for three cents a pint, how much will three quarts cost ?

8. What will be the cost of a bushel of cranberries at one cent a pint ?

9. If apples sell for ten cents a half-peck, how much will a bushel of apples cost ?

114. Find the cost of:

1. A bushel at 8 ¢ a peck.
2. 3 pecks at 28 ¢ a bushel.
3. 2 pecks at 5 ¢ a quart.
4. 3 quarts at 2 ¢ a pint.
5. A pint at 20 ¢ a quart.
6. A quart at 80 ¢ a peck.
7. 3 quarts at 40 ¢ a peck.
8. 3 pecks at 80 ¢ a bushel.



LENGTH.

12 Inches make 1 Foot. 3 Feet make 1 Yard.

115. 1. About how long is this page? How wide is your slate?

2. How long is your slate? Is it 12 in. (inches) long? Is it a foot long?

3. How tall is Frank? Is he 3 ft. (feet) tall?

4. How wide is your desk? Is it a yard wide?

5. Is your class room 5 yds. (yards) wide? Six yards? Is it fifteen feet wide?

6. How high is your room?

7. Your house is how wide? How high?

8. How many in. are there in a ft.?

9. How many inches are there in a yd.?

10. If there are thirty-six inches in a yard, how many inches are there in a quarter of a yard?

11. If there are nine inches in a quarter of a yard, how many inches are there in half a yard? In three-quarters of a yard?

12. How many feet are there in one-third of a yard? In two-thirds, how many feet are there?

116. Find the cost of:

1. Half a foot of brass wire at three cents a foot.

2. Three yards of rope at five cents a foot.

3. A quarter of a yard of cloth at thirty-six cents a yard.

Bronze.

Silver.

Silver.

VALUES.

10 Cents make 1 Dime.
10 Dimes make 1 Dollar.
100 Cents make 1 Dollar.

117. 1. A nickel is equal to how many cents ?

2. To how many cents is a dime equal ? To how many nickels is a dime equal ?

3. How many dimes make a dollar ?

4. How many dimes are equal to half a dollar ?

5. If a dime is equal to ten cents, to how many cents is a dollar or ten dimes equal ? Half a dollar = ?

6. A quarter of a dollar is equal to twenty-five cents. To how many dimes and nickels is it equal ?

7. How many quarters make a dollar ? Answer : Four.

8. In half a dollar, how many quarters are there ?

9. How many cents are there in a quarter of a dollar ? In half a dollar ? In three-quarters of a dollar ?

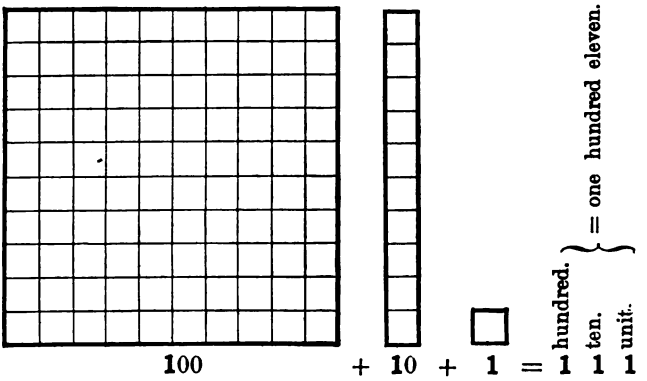
10. How many dimes are there in twenty cents ? In fifty cents ? In seventy cents ? In ninety cents ?

118. What is the value of :

1. Five yards of calico at a dime a yard ?
2. Three bushels of apples at a quarter of a dollar a bushel ?
3. One pound of coffee, if two pounds cost sixty cents ?
4. One-half gallon of milk at a dime a quart ?

ONE HUNDRED TO ONE THOUSAND.

WRITING NUMBERS.



119. 1. In 111 what does the 1 in the first or right-hand place stand for? The 1 in the second place? The 1 in the third or left-hand place?

2. What does 115 stand for? 151? 511? 200? 300?

3. In 152 how many hundreds are there? How many tens? How many units?

4. How many hundreds, tens, and units are there in 169? In 273? In 431? In 645? In 789? In 987?

The figure standing at the left represents hundreds; the next figure, tens; the figure at the right, units. If there are no tens or units, their places are filled with ciphers.

120. Read and show the meaning of the following:

111	124	108	341	808
112	128	172	450	700
115	134	232	405	728
119	139	269	399	660
120	147	310	933	555

121. Write with figures the following:

1. One hundred eleven.
2. One hundred ten.
3. One hundred one.
4. Three hundred.
5. Three hundred thirty.
6. Three hundred forty.
7. Five hundred twenty.
8. Six hundred six.
9. Six hundred sixty.
10. Eight hundred eight.
11. Three hundred thirty-three; three hundred three.
12. Five hundred eighty-nine; five hundred ninety.
13. Seven hundred seventy-five; seven hundred seven.
14. Eight hundred eighty-eight; six hundred eighty.
15. Nine hundred nine; nine hundred ninety-nine.

122. To write **ten** *hundred,* or **one thousand,** write **10** with two ciphers or **1** with three ciphers at the right; thus, **1000.**

EQUAL GROUPS.

123. 1. How many twos are there in 4? One-half of four is how many?

2)2 / 1		
2)4 / 2		
2)6 / 3		
2)8 / 4		
2)10 / 5		
2)12 / 6		
2)14 / 7		
2)16 / 8		
2)18 / 9		
2)20 / 10		

Two in ***four,***

2) 4

2 times.

One-half of ***four,***

2) 4

is 2.

2. If four is divided into two equal parts, that is, *divided by two,* how many will there be in each part?

Four divided by ***two*** equals ***two.***

4 ÷ 2 = 2

or 2) 4

2

3. How many twos are there in six? One-half of six is how many?

Two in ***six,***

2) 6

3 times.

One-half of ***six,***

2) 6

is 3.

4. If six is divided into two equal parts, that is, *divided by two,* how many will there be in each part?

Six divided by ***two*** equals ***three.***

6 ÷ 2 = 3, or 2) 6 / 3

5. How many twos are there in eight? In ten? In twelve? In fourteen? In sixteen? In eighteen? In twenty?

6. How much is one-half of eight? Of ten? Of twelve? Of fourteen? Of sixteen? Of eighteen? Of twenty?

7. How much will there be in each part, if you divide eight by two? If you divide ten? If twelve? If fourteen? If sixteen? If eighteen? If twenty?

8. If you have four apples, to how many little girls could you give two apples each?

9. If you divide six marbles equally between two boys, how many will each boy have?

124. Show by the diagram that:

2	2	2	2	2	2	2	2	2	2
1	2	3	4	5	6	7	8	9	10
2)2	2)4	2)6	2)8	2)10	2)12	2)14	2)16	2)18	2)20
1	2	3	4	5	6	7	8	9	10

Read thus: 7 times 2 are 14; ½ of 14 is 7, or 2 in 14, 7; etc.

125. 1. How many threes are there in six? In nine? In twelve? In fifteen? In eighteen? In twenty-one? In twenty-four? In twenty-seven? In thirty?

3)3 / 1			
3)6 / 2			
3)9 / 3			
3)12 / 4			
3)15 / 5			
3)18 / 6			
3)21 / 7			
3)24 / 8			
3)27 / 9			
3)30 / 10			

2. How much is one-third of nine? Of twelve? Of fifteen? Of eighteen?

3. How much will there be in each part, if you divide twelve by three?

126. Show by the diagram that:

3	3	3	3	3
1	2	3	4	5
3)3	3)6	3)9	3)12	3)15
1	2	3	4	5

3	3	3	3	3
6	7	8	9	10
3)18	3)21	3)24	3)27	3)30
6	7	8	9	10

127. Copy the tables for 2 and for 3.

128. Construct diagram for 4; explain and copy:

4	4	4	4	4	4	4	4	4	4
1	2	3	4	5	6	7	8	9	10
4)4	4)8	4)12	4)16	4)20	4)24	4)28	4)32	4)36	4)40
1	2	3	4	5	6	7	8	9	10

ORAL PROBLEMS.

129. 1. Alice buys a yard of lace for eight cents. What does she pay for half a yard? For a quarter of a yard?

2. Mary paid ten cents for two lead-pencils. How much did one pencil cost her?

3. At two cents each how many pencils can be bought for ten cents? For twelve cents? For fourteen cents?

4. Minnie is sixteen years old; Sadie is one-fourth as old. How old is Sadie?

5. Fourteen birds sat on telegraph wires. If one-half sat on one wire, and the other half on another wire, how many birds sat on each wire?

6. A class consists of eighteen boys and girls equally divided. How many boys are there in the class?

7. If a man earns twelve dollars in three days, how many dollars does he earn in one day? In four days?

8. If four men earn forty dollars in a week, how many dollars does each man earn?

9. Susie has thirty-two cents with which to buy lace. If the lace costs four cents a yard, how many yards can she buy? If she has twenty cents? Forty cents?

10. How many yards of lace at three cents each can Susie buy for twenty-four cents? For twenty-one cents? For twenty-seven cents?

11. Three feet make a yard. How many yards are there in eighteen feet?

12. In four pecks there are thirty-two quarts. How many quarts are there in one peck?

13. What is one-third of fifteen? Eighteen? Twenty-one? Twenty-four? Twenty-seven? Thirty?

14. What is one-fourth of twelve? Sixteen? Twenty? Twenty-four? Twenty-eight? Thirty-two? Thirty-six?

SIGHT EXERCISES.

130. Read sums, or remainders, at sight:

12	22	13	23	14	24	15	25	16	26
3	3	4	4	5	5	6	6	7	7
—	—	—	—	—	—	—	—	—	—

13	23	14	24	15	25	16	26	17	27
5	5	6	6	7	7	8	8	9	9
—	—	—	—	—	—	—	—	—	—

WRITTEN PROBLEMS.

131. 1. If Thomas has one dollar, four dimes, and five cents, how much money has he ?

One dollar and forty-five cents.

$1 . 4 5 $1.45

2. Edward earned one dollar, no dimes, and five cents. How much money did he earn ?

One dollar and five cents.

$1 . 0 5 $1.05

3. Mabel has one dollar, four dimes, and no cents. How much money has she ?

One dollar and forty cents.

$1 . 4 0 $1.40

4. Sarah spends no dollars, four dimes, and no cents, how much money does she spend ?

Forty cents.

$. 4 0 $.40

5. Mr. James has a dollar and forty-five cents in one pocket, and forty-two cents in another pocket. How much money has he in both pockets ?

6. If Mr. James has one dollar and eighty-seven cents in his pockets and spends forty-two cents, how much money will he have left ? $1.87 − $.42 = ?

7. Frank saved in one month one dollar and thirty-four cents, and in the next month, forty-five cents. How much money did he save in the two months ?

8. Frank had one dollar and seventy-nine cents and spent forty-five cents. How much money did he then have?

9. Mary went to market with one dollar and fifty-eight cents. How much did she have after spending forty-two cents?

132. Copy, and find the sums:

$1.41	$1.23	$1.76	$1.05	$1.00
.36	.62	.20	.63	.49
$4.08	$5.84	$5.26	$3.66	$7.13
.59	1.07	2.65	3.06	2.77

133. Copy, and find the remainders:

$1.77	$1.85	$1.96	$1.68	$1.49
.36	.62	.20	.63	.49
$2.45	$4.84	$5.43	$3.91	$4.17
.07	.09	.06	.08	.09

EQUAL GROUPS.

134. Copy, and explain by a diagram, the table for 5:

5	5	5	5	5	5	5	5	5	5
1	2	3	4	5	6	7	8	9	10
5)5	5)10	5)15	5)20	5)25	5)30	5)35	5)40	5)45	5)50
1	2	3	4	5	6	7	8	9	10

135. Show by the diagram that:

15 ÷ 5 = 3. 20 ÷ 5 = 4. 25 ÷ 5 = 5. 30 ÷ 5 = 6.
15 ÷ 3 = 5. 20 ÷ 4 = 5. 25 ÷ 5 = 5. 30 ÷ 6 = 5.

35 ÷ 5 = 7. 40 ÷ 5 = 8. 45 ÷ 5 = 9. 50 ÷ 5 = 10.
35 ÷ 7 = 5. 40 ÷ 8 = 5. 45 ÷ 9 = 5. 50 ÷ 10 = 5.

136. Copy, and explain by a diagram, the table for 6:

6	6	6	6	6	6	6	6	6	6
1	2	3	4	5	6	7	8	9	10
6)6	6)12	6)18	6)24	6)30	6)36	6)42	6)48	6)54	6)60
1	2	3	4	5	6	7	8	9	10

137. Copy, and explain by a diagram, the table for 7:

7	7	7	7	7	7	7	7	7	7
1	2	3	4	5	6	7	8	9	10
7)7	7)14	7)21	7)28	7)35	7)42	7)49	7)56	7)63	7)70
1	2	3	4	5	6	7	8	9	10

ORAL PROBLEMS.

138. 1. On a hill there were twenty-five sheep in five equal groups. How many sheep were there in each group?

2. How many tumblers, at five cents each, can be bought for twenty cents? For thirty-five cents? For forty cents?

3. If berries are five cents a quart, how many quarts can be bought for fifty cents? For forty-five cents?

4. Jane bought six rolls of tape for thirty-six cents. What did one roll cost? What would seven cost?

5. If Edward earns six dollars a week, how long will it take him to earn forty-eight dollars? Fifty-four dollars?

6. In four weeks John saved twenty-four dollars. How much did he save in one week?

7. On six stalks of a rose bush there grew forty-two roses in equal groups. How many roses were there on each stalk?

8. How many clocks, at seven dollars each, can be bought for thirty-five dollars? For sixty-three dollars?

9. Thirty-five dollars will pay for how many hats at five dollars each? At seven dollars each? $35 ÷ 7 = ?

10. How many yards of plush can be bought for forty-two dollars, if each yard costs six dollars? Seven dollars?

11. How many weeks are there in forty-nine days?

WRITTEN PROBLEMS.

139. 1. Sarah spent two dollars and thirty-two cents for muslin, and three dollars and thirty-one cents for an umbrella. How much altogether did she spend?

2. Mr. French bought three umbrellas for three dollars and thirty-one cents each. How much did they cost him?

3. A railroad ticket from New York to St. Louis cost twenty-two dollars. How much did eight tickets cost?

4. If Mr. Thompson has thirty-five dollars and spends twenty-three for rent, how many dollars will he have left?

5. A landlord received twenty-three dollars from one tenant, thirty-five dollars from another, and forty-one dollars from another. How many dollars in all did he receive?

6. A steamship sailed two hundred and fifty miles in one day, two hundred and twenty-two miles the second day, and two hundred and sixteen miles the third day. How many miles did the steamship sail in the three days?

7. If a steamship sails two hundred and twenty-one miles each day, how far will it sail in four days?

140. Copy, and find the sums:

$2.32	$1.73	$4.65	$3.19	$5.50
3.21	2.03	2.23	2.60	3.07
4.17	3.22	3.05	1.02	1.25

141. Copy, and find the remainders:

$4.27	$5.68	$3.75	$8.70	$9.08
2.16	2.39	1.48	5.30	4.06

142. Copy, and find the products:

$2.46	$3.27	$2.24	$1.13	$1.12
2	3	4	5	8

EQUAL GROUPS.

143. Copy, and show with a diagram that:

8	8	8	8	8	8	8	8	8	8
1	2	3	4	5	6	7	8	9	10
8)8	8)16	8)24	8)32	8)40	8)48	8)56	8)64	8)72	8)80
1	2	3	4	5	6	7	8	9	10

144. Show by diagram that:

$24 \div 8 = 3.$ $32 \div 8 = 4.$ $40 \div 8 = 5.$ $48 \div 8 = 6.$
$24 \div 3 = 8.$ $32 \div 4 = 8.$ $40 \div 5 = 8.$ $48 \div 6 = 8.$

$56 \div 8 = 7.$ $64 \div 8 = 8.$ $72 \div 8 = 9.$ $80 \div 8 = 10.$
$56 \div 7 = 8.$ $64 \div 8 = 8.$ $72 \div 9 = 8.$ $80 \div 10 = 8.$

145. Construct similar table and diagram for 9 and for 10.

ORAL PROBLEMS.

146. 1. If Jane pays twenty-four cents for three quarts of strawberries, how much does she pay for one quart?

2. Harry bought six kites at four cents each. How much change should he receive, if he pays for them with a quarter of a dollar or twenty-five-cent piece?

3. How many tops can George buy for twenty-four cents, if each top costs him eight cents? Three cents? Six cents?

4. If Frank has three dimes and a five-cent piece, and he buys four drawing slates at eight cents each, how much money will he have left?

5. If Frank has forty cents and buys nine lead-pencils at four cents each, how much money will he have left?

6. How many car fares at five cents each will one dime pay for? Four dimes? Five dimes?

7. How many copy books at eight cents each can be bought for forty cents? For thirty-two cents? For forty-eight cents? For fifty-six cents?

8. How many hours will it take a horse to travel fifty-six miles, if he travels seven miles an hour?

9. At ten cents each, what do five picture books cost? At nine cents each? At eight cents each?

10. George has eighty-five cents. If he buys nine rubber balls at ten cents each, will he have money enough? At nine cents each, how much change will he have left?

11. How many spools of silk can Carrie buy for seventy-two cents, if each spool costs eight cents? Nine cents?

12. Thomas had to ride sixty-five miles. He traveled all but two miles in seven hours. How many miles did he travel in an hour?

13. How many yards of ribbon at six cents a yard can be bought for fifty-four cents? At nine cents a yard?

14. Fred had thirty cents. He bought three oranges at six cents each and two pears at five cents each. How much money did he have left?

SIGHT EXERCISES.

147. Read products at sight:

6	6	6	6	6	6	7	7	7	7
6	5	7	8	9	4	7	8	9	5
7	8	8	8	9	9	9	9	9	9
4	8	7	9	9	7	6	3	4	5

148. Read quotients at sight:

2)6	2)8	2)10	2)12	2)14	2)16	2)18	2)20
3)9	3)12	3)15	3)18	3)21	3)24	3)27	3)30
4)12	4)16	4)20	4)24	4)28	4)32	4)36	4)40

WRITTEN PROBLEMS.

149. 1. In January there are thirty-one days, and in February, in a leap year, twenty-nine days. How many days then are there in both months ?

2. If a gentleman has sixty dollars and he spends twenty-nine dollars, how many dollars will he have left ?

3. If a suit of clothes costs forty-eight dollars and an overcoat thirty-two dollars, how much will both cost ?

4. If Mr. Merideth has eighty dollars and he spends forty-eight dollars for a suit of clothes, how much money will he have left ?

5. Mrs. Arnold paid the grocer seventeen dollars and the butcher thirteen dollars. How much did she pay both ?

6. If Mrs. Arnold out of thirty dollars pays the grocer seventeen dollars, how many dollars will she then have ?

7. Jane had three dollars and fifty cents. She spent one dollar and fourteen cents. How much has she left ?

8. Kate has one dollar and twenty-five cents; Harriet has two dollars and forty-five cents. How much have both ?

9. If one overcoat costs twenty-four dollars, how much will three overcoats cost ?

10. What does Mr. Brooks pay for board for four months, if he pays thirty-three dollars each month ?

11. How much does Charles earn in eight months, if he earns thirty-two dollars in one month ?

12. How many miles does a train travel in nine hours, if it travels twenty-three miles each hour ?

13. If Mr. Banks pays forty-two dollars for rent, twenty-seven dollars for groceries, and eighteen dollars for meat in one month, what does he pay altogether ? In three months ?

14. If Mr. Banks has three hundred dollars with which to pay three times eighty-seven dollars for his three months' expenses, how much money will he have left ?

15. Add 453 and 289.

Read: 9, 12 units, or 1 ten, 2 units; write 2 under the units; 1, 9, 14 tens, or 1 hundred, 4 tens; write 4 under the tens; 1, 3, 7 hundreds; write 7 under the hundreds. Answer, 742.

SLATE

453	742
289	289
742	453

16. From 742 take 289.

Since 9 cannot be taken from 2, take 1 of the 4 tens, leaving 3 tens; 1 ten, or 10, and 2 are 12; 9 from 12 leaves 3. 8 tens cannot be taken from 3 tens; take 1 of the 7 hundreds, leaving 6 hundreds; 1 hundred, or 10 tens, and 3 tens are 13 tens; 8 tens from 13 tens leaves 5 tens; 2 hundreds from 6 hundreds leaves 4 hundreds. Answer, 453.

150. Find the sums:

125	233	158	145	456
236	127	224	212	213
314	273	154	198	142
$6.58	$4.86	$3.75	$2.08	$5.94
1.32	2.34	5.45	4.63	2.06

151. Find the remainders:

230	460	371	423	542
116	278	156	116	266
$6.30	$5.50	$3.50	$7.84	$9.75
2.74	2.35	1.65	3.26	6.88

152. Find the products:

$123	$143	$339	$124	$125	$142
4	5	2	8	6	7

EQUAL GROUPS.

153. Copy, and show with diagram that:

11	11	11	11	11	11	11	11	11
1	2	3	4	5	6	7	8	9
11)11	11)22	11)33	11)44	11)55	11)66	11)77	11)88	11)99
1	2	3	4	5	6	7	8	9

154. Construct similar table for 12.

155. Copy, and commit to memory, the following table:

10	10	11	11	11	12	12	12
11	12	10	11	12	10	11	12
10)110	10)120	11)110	11)121	11)132	12)120	12)132	12)144
11	12	10	11	12	10	11	12

ORAL PROBLEMS.

156. 1. If Henry spends fifteen cents, eight cents, and two cents, how much money does he spend? How much change should he receive out of thirty cents?

2. Elmer had fifty cents and he bought five pounds of sugar at six cents and one pound of coffee for fifteen cents. How much change should he receive, if he gives his fifty cents in payment?

3. Margaret bought three yards of lace at nine cents, and two yards of elastic at two cents a yard. How much money did she spend? How much change out of thirty-five cents should she receive?

4. Mamie bought five yards of ribbon at four cents a yard. How much did the ribbon cost her? What change is coming to her out of a twenty-five cent piece?

5. Frank walked for seven hours at the rate of three miles an hour. How far did he walk? How much further must he walk to travel twenty-five miles?

6. If Mrs. Thomas pays twelve cents for milk, eight cents for bread, seven cents for berries, and nine cents for eggs, how much does she spend? How much change will she get out of forty cents?

7. Mr. Jones had twenty-five dollars. He spent eight dollars for shoes, seven dollars for a hat, and six dollars for a silk umbrella. How much money did he have left?

8. How many yards of cloth can be bought for forty dollars, at eight dollars a yard? At four dollars?

9. If a man earns ten dollars a week, how much will he earn in ten weeks? In eleven weeks? In twelve weeks?

10. In a dozen buttons there are twelve buttons. How many buttons are there in ten dozen? In eleven dozen? In twelve dozen or a gross?

11. In a box there were sixty eggs. How many dozen eggs did the box contain? How many dozen are there in seventy-two? In eighty-four? In ninety-six?

12. If seven pounds of prunes are bought for seventy-seven cents, how much do they cost a pound?

13. If a dress can be made from eleven yards of cloth, how many dresses can be made from twenty-two yards? Fifty-five yards? Ninety-nine yards? One hundred and twenty-one yards? One hundred and thirty-two yards?

14. If a man pays twelve cents a day for traveling on the cars and ferry, how much does he pay in a week or seven days? If he pays eleven cents a day?

15. How much does a man receive per hour, if by working twelve hours a day he earns one dollar and eight cents? One dollar and twenty cents? One dollar and thirty-two cents? One dollar and forty-four cents?

16. There are twenty-four hours in a day. How many hours are there in half of a day? In a third of a day? In a fourth? In a sixth? In an eighth?

SIGHT EXERCISES.

157. Read sums, or remainders, at sight:

36	35	34	33	32	38	37	36	35	34
5	6	7	8	9	4	5	6	7	8

49	48	47	46	45	55	54	53	52	51
4	5	6	7	8	7	8	9	9	9

158. Read products at sight:

9	8	7	6	5	10	11	12	12	11
9	8	7	6	5	10	11	12	11	10

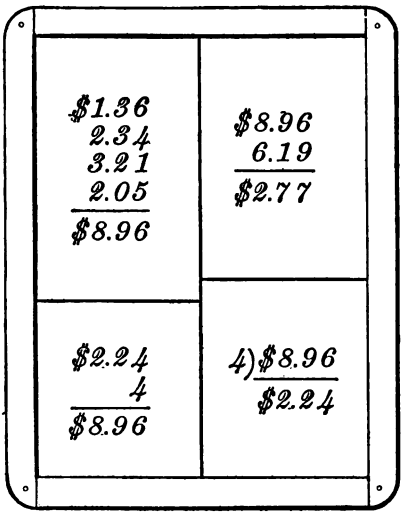
10	9	8	7	9	8	5	6	12	12
9	8	7	6	7	6	8	9	6	8

159. Read quotients at sight:

4)16	4)20	4)24	4)28	4)36	4)44	4)48	4)32
5)20	5)30	5)25	5)35	5)40	5)45	5)55	5)60
6)36	6)30	6)24	6)42	6)48	6)54	6)60	6)72
7)35	7)42	7)49	7)56	7)63	7)70	7)77	7)84
8)40	8)48	8)56	8)64	8)72	8)80	8)88	8)96
9)45	9)54	9)63	9)72	9)81	9)90	9)99	9)108

WRITTEN PROBLEMS.

160. 1. Can you tell the stories indicated by the work on this slate?



2. Mr. Bates sold a lady a pair of gloves for $1.36; a parasol for $2.34; a dress pattern, $3.21; and trimmings, $2.05. How much was the bill?

3. If Mr. Bates buys goods for $6.19, and sells them for $8.96, does he make or lose? How much does he make?

4. How much will a merchant receive if he sells 4 parasols at $2.24 each?

5. What is the cost of 1 parasol, if 4 cost $8.96?

One parasol will cost one-fourth as much as four parasols. One-fourth of $8 is $2; one-fourth of 9 dimes is 2 dimes with 1 dime left over, which, with the 6 cents, makes 16 cents; one-fourth of 16 cents is 4 cents. Answer, $2.24.

6. There are 78 trees in an orchard. One-third of them are peach trees. How many are peach trees?

One-third of 7 tens is 2 tens with 1 ten left over; 1 ten and 8 units are 18 units; one-third of 18 units is 6 units. Answer, 26 peach trees.

3)78
26

7. Mr. Andrews is on a journey of 372 miles. He has traveled one-third of the distance. How many miles?

Divide 372 by 3: 3 in 3 hundreds, 1 hundred times. 3 in 7 tens, 2 tens times with 1 ten over; 1 ten and 2 units make 12 units; 3 in 12 units, 4 units times. Answer, 124 miles.

3)372
124

8. When Mr. Andrews has traveled 124 miles, how much further must he travel to complete his journey of 372 miles? $372 - 124 = ?$

9. If a railroad train travels 92 miles in 4 hours, how many miles does it travel each hour? $92 \div 4 = ?$

10. If a railroad train travels 25 miles an hour, how far will it travel in 9 hours?

11. Divide 96 by 3; by 4; by 6; by 8.

12. Divide 720 by 3; by 4; by 5; by 6; by 8; by 9.

13. Divide 840 by 4; by 5; by 6; by 7; by 8.

14. If Mr. Harris pays $34 rent per month, how much does he pay in 9 months?

15. If Mr. Morris pays $96 rent for his house for 4 months, how many dollars does he pay for each month? $\$96 \div 4 = ?$

16. A lady went shopping, and purchased in different places the following bills of goods: $2.73, $2.36, $3.58, and $1.32. How much altogether did she spend?

17. How much change out of $10 should a lady receive who has bought goods for $9.99?

18. A gentleman saved $348 one year, $206 the second year, and $410 the third year. How much altogether did he save?

19. If a grocer sells 5 barrels of flour at $6.25 a barrel, how much does he receive for the 5 barrels?

20. If 8 overcoats cost Mr. Thomas $128, how much does 1 overcoat cost him? $\$128 \div 8 = ?$

21. A lady had $8.65 with which to go shopping. After spending $7.48, how much did she have left?

22. Find the sum of 239, 101, 576, and 84.

23. If you take 637 from 736, what is the remainder?

24. Multiply 123 by 4; by 5; by 6; by 7; by 8.

25. Divide 448 by 4; 672 by 6; 896 by 8; 972 by 9.

26. $4.93 is how much less than $5.61?

PART II.

NOTATION AND NUMERATION.

1. A **unit** is a single thing, or one.

One man, *one* desk, $1, 1 dime, 1 cent, 1 company, 1 are units.

2. A **number** is a unit or a collection of units.

Three men, *five* desks, $4, 3 dimes, 5 cents, 7 companies, 6 are numbers.

A collection of units is frequently a unit. Thus, 10 tens are 1 hundred ; 100 ¢ are $1 ; 3 feet are 1 yard ; 60 minutes are 1 hour.

3. If the name of the unit is given, the number is a **concrete number.**

Seven *horses,* eight *pounds,* five *yards,* $3 are concrete numbers.

4. If the name of the unit is not given, the number is an **abstract number.**

Seven, eight, five ; 7, 8, 5 are abstract numbers.

5. **Arithmetic** teaches the use of numbers.

6. **Notation** is the art of *writing* numbers.

7. **Numeration** is the art of *reading* numbers.

8. Numbers may be expressed by *figures* or by *letters.*

9. **Figures** are characters or marks used to represent numbers. They are :

1 2 3 4 5 6 7 8 9 0

Figures are not numbers, but marks or symbols representing them.

10. The first nine figures are called *digits,* or *significant figures.*

11. The last figure, *0,* represents *naught* or *nothing ;* it is

called *naught, zero,* or *cipher.* It is used with the significant figures to give them their proper place and value.

12. Arabic Notation represents numbers

BY FIGURES.

13. Read the following, showing that the value of a figure is made ten times as great by moving it one place to the left.

	Hundreds.		Tens.		Units.		h. t. u.
1.	**100**	+	**10**	+	**1**	=	**1 1 1.**
2.	**300**	+	**30**	+	**3**	=	**3 3 3.**
3.	**500**	+	**50**	+	**5**	=	**5 5 5.**

Thus: 1 is 1 unit; 10 is 1 ten or 10 units; 100 is 1 hundred, 10 tens, or 100 units; 111 is 1 hundred, 1 ten, and 1 unit, or one hundred eleven.

14. Explain as above the meaning of the following:

1. 2.	*4.* 4.	*7.* 6.	*10.* 8.	*13.* 79.
2. 20.	*5.* 40.	*8.* 60.	*11.* 86.	*14.* 790.
3. 222.	*6.* 444.	*9.* 666.	*12.* 864.	*15.* 990.

15. Read the following:

1. 328.	*3.* 506.	*5.* 719.	*7.* 670.	*9.* 990.
2. 438.	*4.* 625.	*6.* 763.	*8.* 806.	*10.* 999.

16. *Ten* hundred is written **1000**, and is read ***one thousand.***

17. Read, and show the meaning of the following:

	Thousands. h. t. u.	Units. h. t. u.		Thousands. h. t. u.	Units. h. t. u.
1.	1 0 3,	1 0 3	*4.*	4 7 5,	3 6 9
2.	2 5 0,	2 5 0	*5.*	2 6 7,	5 2 3
3.	4 0 7,	4 0 7	*6.*	3 5 8,	2 1 7

The first number is read: one hundred three thousand, one hundred three.

18. *Ten* hundred thousand, is written **1000000**, and is read *one* ***million.*** A million is a *thousand* thousands.

19. Read the following and show that the value of a figure is made one thousand times as great by moving it three places to the left:

	Millions.	Thousands.	Units.
1.	**1**,000,000	**1**,000	**1**
2.	**4**,000,000	**4**,000	**4**
3.	**34**,000,000	**34**,000	**34**

4. **234**,000,000 + **234**,000 + **234** = **234,234,234.**

Read 234,234,234: two hundred thirty-four *million*, two hundred thirty-four *thousand*, two hundred thirty-four.

20. Read, and show the meaning of the following:

1. 8; 8,000; 8,000,000; 8,008,008.
2. 10; 10,000; 10,000,000; 10,010,010.
3. 63; 63,000; 63,000,000; 63,063,063.

21. Read the following:

1. 555,000.	*4.* 60,600.	*7.* 3,300,300.
2. 700,000.	*5.* 215,111.	*8.* 43,430,043.
3. 975,000.	*6.* 305,503.	*9.* 543,175,225.

22. 1. Beginning at the right, the first three places, units, tens, and hundreds, make the **first period** or the *period of units.*

2. The three places of the second group are also named units, tens, and hundreds, and form the **second period** or the *period of thousands.*

3. The three places of the third group are also named units, tens, and hundreds, and form the **third period** or the *period of millions.*

A comma separates the periods.

Table.

PERIODS.	MILLIONS.				THOUSANDS.				UNITS.		
	9th.	8th.	7th.		6th.	5th.	4th.		3d.	2d.	1st.
ORDERS OR PLACES.	Hundreds.	Tens.	Units.		Hundreds.	Tens.	Units.		Hundreds.	Tens.	Units.
NUMBERS TO BE READ.	3	7	5	,	6	0	8	,	4	2	0
	1	2	3	,	4	5	6	,	7	8	9
	2	0	8	,	4	3	9	,	7	0	9
			3	,	1	1	7	,	6	4	2
		9	0	,	2	0	0	,	3	6	0
	7	0	0	,	0	7	0	,	0	0	7
	9	0	9	,	0	0	0	,	9	0	0

23. 1. The figures in the three places of any period are read as if they formed a number by themselves, and then the name of the period is read.

2. Any place or period not used is filled with ciphers and is not read.

3. The first of these numbers expresses 3 hundreds 7 tens 5 units of *millions,* 6 hundreds 0 tens 8 units of *thousands,* 4 hundreds 2 tens 0 units of *units ;* and is read : three hundred seventy-five million six hundred eight thousand four hundred twenty.

The word *and* is not used in reading any whole number. The name of the first or *units'* period is not given in reading a number. The final *s* is omitted in reading the names of the other periods.

24. Read and explain the other numbers in the above table.

25. Read the following:

1. 30,708.	*4.* 500,500.	*7.* 6,606,440.
2. 300,649.	*5.* 500,050.	*8.* 37,037,037.
3. 325,325.	*6.* 500,005.	*9.* 400,000,400.

26. Write the following:

1. Forty thousand, four hundred.
2. Four hundred four thousand, four hundred four.
3. Three hundred thousand, six hundred.
4. Three hundred thousand, sixty.
5. Twenty million, twenty thousand, twenty.
6. Seven hundred million, seventy thousand, seven.

27. Roman Notation represents numbers

BY LETTERS.

28. The Romans used the following letters to represent numbers:

I	V	X	L	C	D	M
1	5	10	50	100	500	1000.

29. The letters, except V L D, are repeated, to repeat their values; thus, III = 3; XXX = 30; CCCC = 400.

30. Letters of less value written *after* those of greater value indicate the *sum* of the values. Thus, VI = 6; XV = 15; LXX = 70; CL = 150; DCX = 610.

31. A letter of less value written *before* one of greater value indicates the *difference* between the two values.

Thus: IV = 4, IX = 9, XL = 40, XC = 90, LIX = 59, CXL = 140.

32. Read the following:

1. XIV.	*3.* XLV.	*5.* XCIX.	*7.* DCCCXL.
2. XXIX.	*4.* LXXXIV.	*6.* CCLXIX.	*8.* MDCCXI.

33. Write the following:

1. Nineteen.	*4.* Sixty-eight.	*7.* Three hundred, three.
2. Twenty-four.	*5.* Eighty-nine.	*8.* One thousand, fifty.
3. Thirty-six.	*6.* Ninety-three.	*9.* Six thousand, six.

ADDITION.

34. 1. Harry has 7 peaches and Frank has 5. How many peaches have both?

2. A farmer has 6 cows in one pasture and 9 in another. How many cows has he in both pastures?

3. John bought a lemon for 3 cents and 4 peaches for 10 cents. How many cents did he give for all?

4. Edward begins to work at 6 o'clock in the morning, and works 6 hours. At what o'clock does he stop work?

5. Mary counted 9 roses on one rose-bush and 7 on another. How many did she count on both bushes?

35. To **add** two or more numbers is to find how many units there are in the numbers taken together.

36. The number found by adding two or more numbers is called their **sum.**

37. **Addition** is the process of finding the sum of two or more numbers.

38. The **sign of addition** is +, called *plus,* meaning *more.* Thus, 5 + 3 is read 5 plus 3, or 5 and 3.

39. The **sign of equality** is =, and is read *equals* or *are.* Thus, 7 + 3 = 10 may be read 7 plus 3 equals 10, or 7 and 3 are 10.

40. Drill Exercises. **Count:**

1. By 2's from 2 to 100. From 1 to 101.
2. By 3's from 3 to 99. From 1, 2 to 100, 101.
3. By 4's from 4 to 100. From 1, 2, 3 to 101, 102, 103.
4. By 5's from 5 to 100. From 1, 2, 3, 4 to 101, etc.
5. By 6's from 6 to 102. From 1, 2, 3, 4, 5 to 103, etc.
6. In similar manner with 7, 8, and 9 to 98, etc.

41. SIGHT EXERCISES. **Read sums at sight:**

2	2	9	1	8	3	7	4	6	5
3	9	9	9	9	9	9	9	9	9
9	2	9	1	8	3	7	4	6	5
3	7	7	7	7	7	7	7	7	7
1	2	9	1	8	3	7	4	6	5
3	4	4	4	4	4	4	4	4	4
8	2	9	1	8	3	7	4	6	5
3	6	6	6	6	6	6	6	6	6
3	2	9	1	8	3	7	4	6	5
3	8	8	8	8	8	8	8	8	8
4	2	9	1	8	3	7	4	6	5
3	5	5	5	5	5	5	5	5	5
6	2	9	7	8	3	7	4	6	5
3	2	2	3	2	2	2	2	2	2
5	2	9	1	8	3	7	4	6	5
3	1	1	1	1	1	1	1	1	1

These exercises comprise all the possible additions of two numbers each expressed by one digit. By daily practice learn to tell the sums rapidly, reading them in as many different directions as possible.

42. Oral Problems. 1. Frank is 7 years old, his sister Nellie is 8 years older. How old is Nellie ?

2. Thomas shot 6 squirrels on Monday, and 9 on Tuesday. How many squirrels did he shoot in the two days ?

3. A gardener picked 5 bushels of berries in one day, and 10 bushels in another. How many bushels did he pick in the two days ?

4. A farmer filled 5 barrels with apples from one tree, and 4 barrels from another. How many barrels did both trees yield ?

5. A planter gathered 6 bushels of oranges from one tree, 4 bushels from a second, and 7 from a third. How many did he gather from the three trees together ?

6. John has 7 marbles, Frank has 4 more than John, and Edward 9 more than both together. How many marbles has Edward ?

7. A man walked 6 miles in one hour, 5 miles the next hour, and 4 miles the next. How many miles did he walk in the three hours ?

8. A person went to a fair, and spent 9 dollars at one table, 4 dollars at a second, 7 dollars at a third, and found he had only 5 dollars left in his purse. How many dollars did he have at first ?

9. In a deer-hunt in the mountains, one hunter killed 9 deer, another 7, and two others killed 6 each. How many deer altogether did they kill ?

10. A lady bought lace for 10 cents, ribbon for 6 cents, and elastic for 3 cents. How much did she spend ?

11. If Mr. Bruce pays $8 for a hat, $6 for a pair of shoes, and $3 for a pair of gloves, how much money does he spend ?

12. There are 9 sheep in one field ; 8 in a second field ; 7 in a third field ; and 6 in a fourth field. How many sheep are there in the four fields together ?

43. To find the sum, when each column is less than 10.

1. Find the sum of $32,401; $110,254; $24,142; and $211,201.

$32,401
110,254
24,142
211,201
———
$377,998

Explanation.—1. The numbers are written so that figures representing units of the same order stand in the same column.

2. Each column is then added by itself, and its sum is placed underneath the column. Thus, 3, 7, **8**; 4, **9**; 3, 5, **9**; etc.

3. Write the dollar sign before the first number and before the sum. Answer, $377,998.

2.	3.	4.	5.
100,362	25,041	30,302	202,063
55,403	300,602	7,040	10,501
1,011	40,120	51,213	321,201
12,212	102,013	200,001	32,020

44. Read sums at sight:

9	19	29	39	49	59	69	79	89
2	2	2	2	2	2	2	2	2
8	18	28	38	48	58	68	78	88
3	3	3	3	3	3	3	3	3
7	17	27	37	47	57	67	77	87
4	4	4	4	4	4	4	4	4
6	16	26	36	46	56	66	76	86
5	5	5	5	5	5	5	5	5

45. Construct and read tables for 12, 13, 14, 15, 16, 17, and 18 similar to those in Art. 44.

46. Find the sums:

3	5	3	7	3	5	3	3	6	7
6	3	4	2	3	3	2	3	1	2
4	6	6	1	2	2	4	2	5	4
1	1	2	5	3	2	1	2	3	2
4	5	4	9	7	6	7	9	6	4
4	6	2	6	5	3	7	6	4	8
8	6	9	3	7	8	6	0	2	4
6	9	6	4	7	6	7	4	5	6
7	3	5	6	8	9	7	9	8	9

47. To find the sum, when columns equal or exceed 10.

1. Add 45,675, 206,347, 18,789, 116,214.

Explanation.—1. Write the numbers so that figures representing units of the same order stand in the same column.

2. Add units: 4, 13, 20, 25, or 2 tens and 5 units. Write 5 under column of units, and add the 2 tens with the tens.

3. Add tens: 2, 3, 11, 15, 22 tens, or 2 hundreds and 2 tens. Write 2 tens under the column of tens and add the 2 hundreds with the hundreds.

```
 45,675
206,347
 18,789
116,214
-------
387,025
```

4. The other columns are added in similar manner. If the sum of any column contains units and tens, the units are written under the column and the tens are added with the units in the column of the next higher order. Answer, 387,025.

NOTE.—In practice, simply think the additions and write results; thus, 4, 13, 20, 25—***5***; 2, 3, 11, 15, 22—***2***; 2, 4, 11, 14, 20—***0***; etc.

PROOF.—To test the correctness of the answer, add the columns down instead of up and find the same result.

2.	3.	4.	5.
67,483	154,209	80,742	206,083
345,279	73,687	327,069	74,874
106,354	142,536	45,827	166,548
72,368	24,775	163,245	27,625

48. Find the sums:

1.	2.	3.	4.
450,680	69,106	102,207	505,780
78,504	117,543	98,080	230,900
107,240	26,089	603,701	62,009
360,173	530,208	186,050	105,043

5.	6.	7.	8.
701,107	158,409	260,075	99,075
43,340	37,683	189,007	368,860
100,100	201,478	53,536	77,079
72,279	352,067	200,020	100,085
3,715	175,054	191,266	77,777

NOTE.—Teachers should supply in abundance columns of numbers for drill in addition.

WRITTEN PROBLEMS.

49. 1. Mr. Harrison made in his business $5,625 the first year; $7,080, the second year; $10,807, the third year; and $9,097, the fourth year. How much did he make in the four years together?

2. A farmer had 375 acres of pasture land; 1,050 acres of wheat; 4,600 acres of corn; and 10,870 acres of forest. How many acres in all did he have?

3. A merchant bought 7,050 barrels of flour; 25,000 barrels of potatoes; 15,420 barrels of apples; and 2,910 barrels of sugar. How many barrels altogether did he buy?

4. A lady in shopping spent the following amounts: $6.07 ; $4.23 ; $9.16 ; $3.45 ; and $15.32. How much money did she spend ?

5. A school is divided into five classes. The first class contains 16 pupils ; the second, 25 ; the third, 36 ; the fourth, 39 ; and the fifth, 52. How many pupils are there in the school ?

6. A man spends of his income $1,250, and lays up $525. What is his income ?

7. From six pear-trees were gathered, respectively, 177, 147, 88, 112, 219, and 27 pears. How many were gathered in all ?

8. A landlord leases his land to four tenants. To one he leases 87 acres ; to the second, 212 ; to the third, 325 ; and to the fourth, 160. How many acres does he lease altogether ?

9. A person born January 1, 1807, died at the age of 34. In what year did he die ?

10. A merchant has four pieces of linen. One piece contains 25 yards ; the second, 37 yards ; the third, 49 ; the fourth, 58. How many yards in all are there ?

11. A certain work is in five volumes. The first contains 556 pages ; the second, 650 ; the third, 572 ; the fourth, 671 ; and the fifth, 561. How many pages are there in all the volumes together ?

12. Mr. Bush's orchard contains 3,250 apple-trees, 1,257 peach-trees, and 275 pear-trees. How many trees has he ?

13. A man planted an apple-orchard in 5 rows, each row containing 276 trees. How many trees did he plant ?

14. A forest contained 3,640 chestnut-trees, 5,320 oaks, 560 hickory-trees, 125 tulip-trees, and 375 elms. How many trees were there in the forest ?

15. A borrowed of B, $376 ; of C, $1,250 ; and of D, $275. How much in all did he borrow ?

16. A trader paid for flour, $950; for corn, $1,850; for wheat, $2,500. What did he pay for the whole?

17. A gentleman owns a farm worth $3,500; a city-house and lot worth $25,000; bank-stock valued at $2,000; and has money in bank to the amount of $4,280. What is the amount of these sums?

18. A farmer bought a horse for $225; a yoke of oxen for $195; and 3 cows for $185. How much did they all cost?

19. Henry counted the kernels on 5 ears of corn. He found on the first, 387 kernels; 402 on the second; 427 on the third; 355 on the fourth; and 499 on the fifth. What was the whole number of kernels?

20. A school is arranged in five grades, the first grade containing 21 boys and 25 girls; the second grade, 27 boys and 31 girls; the third, 29 boys and 30 girls; the fourth, 32 boys and 26 girls; and the fifth, 30 boys and 30 girls. The school has how many boys? How many girls? How many boys and girls?

21. I bought of the grocer 21 pounds of sugar for $1.68; 14 pounds of coffee for $2.80; 25 pounds of rice, $1.75; 32 pounds of butter, $8.64; 10 pounds of prunes, 90 cents: 5 pounds of raisins, 63 cents. What was the entire weight of the articles bought, and what was their cost?

22. A father gives to one daughter $5,400; to a second daughter, $3,200; and to his son as much as to both daughters together. How much did he give to all three?

23. The first of three numbers is 4,560; the second is 9,742; the third is as much as the other two together. What is the sum of the three numbers?

24. The distances between New York and San Francisco by the Panama route are: 1,260 miles to Havana; 1,054 miles to Aspinwall; 58 miles to Panama; and 3,616 miles to San Francisco. What is the entire distance?

SUBTRACTION.

50. 1. Frank had 6 marbles, and gave away 4 of them. How many had he left?

2. Nellie had 8 canary birds in a cage; 3 of them escaped. How many birds did she then have?

3. Mr. Harris had 9 horses. How many did he have left, after selling 5 horses?

4. Fred is 15 years old; his brother Henry is 11 years old. Which is the older, and how much?

5. 7 is how much less than 11?

6. Mr. Mills bought cloth for $7 a yard and sold it for $5 a yard. How much did he lose on each yard?

7. What is the difference between 3 and 9? $8 - 8 = ?$

51. To **subtract** one number from another is to take the one from the other.

52. The **remainder** is that which is left after taking away part of a number.

The *difference* between two numbers is the number which added to the less will equal the greater. It is the same as the *remainder* found by taking one number from the other.

53. **Subtraction** is the process of finding a remainder, or of finding the difference between two numbers.

54. The **minuend** is the number to be *diminished;* it is the number from which the other is to be taken.

55. The **subtrahend** is the number to be *taken away;* it is the number to be taken from the other.

From 4625	**Minuend.**
Take 3421	**Subtrahend**
1204	**Remainder.**

56. The **sign of subtraction** is $-$; it is read *minus,* or *less.*

$8 - 5 = 3$ is read 8 minus (less) 5 equals 3.

57. SLATE AND SIGHT EXERCISES. **Find the remainders:**

11	21	31	41	51	61	71	81	91
2	2	2	2	2	2	2	2	2
11	21	31	41	51	61	71	81	91
3	3	3	3	3	3	3	3	3
11	21	31	41	51	61	71	81	91
4	4	4	4	4	4	4	4	4
11	21	31	41	51	61	71	81	91
5	5	5	5	5	5	5	5	5
11	21	31	41	51	61	71	81	91
6	6	6	6	6	6	6	6	6
11	21	31	41	51	61	71	81	91
7	7	7	7	7	7	7	7	7
11	21	31	41	51	61	71	81	91
8	8	8	8	8	8	8	8	8
11	21	31	41	51	61	71	81	91
9	9	9	9	9	9	9	9	9
11	21	31	41	51	61	71	81	91
10	10	10	10	10	10	10	10	10

The above may be used as a sight exercise from the book or from the blackboard.

58. Construct tables similar to the one in Art. 57, for each of the following: 12, 13, 14, 15, 16, 17, 18.

59. DRILL EXERCISES. **Count:**

1. By 1's from 100 to 0.
2. By 2's from 100 to 0; from 99 to 1.
3. By 3's from 99 to 0; from 98, 97 to 2, 1.
4. By 4's from 100 to 0; from 99, 98, 97 to 3, 2, 1.
5. By 5's from 100 to 0; from 99, 98, 97, 96 to 4, 3, 2, 1.

ORAL PROBLEMS.

60. 1. Edward had 10 chickens, but a weasel caught 3 of them. How many did he then have?

2. A farmer planted 12 trees, but 5 of them were destroyed. How many lived?

3. B, owing $13, paid $4. How much did he then owe?

4. A farm had 15 cows in one pasture and 6 in another. How many more were in the first pasture than in the second?

5. When the sun rises at five o'clock, how many hours does it shine before noon?

6. The minuend is 15 and the subtrahend 8. What is the difference or remainder?

7. The minuend is 21 and the remainder 7. What is the subtrahend?

8. Mr. Jones having $20, paid $11 for a coat and $4 for a pair of shoes. How much money had he left?

9. Jane bought a slate for 8 cents, a lead pencil for 5 cents, and a slate pencil for 1 cent. She gave in payment two dimes. How much change should she receive?

10. There were 10 ducks in each of two broods. From one brood 3 died, and from the other 4 were sold. How many ducks were left in the two broods?

61. To find the difference between any two numbers.

1. What is the difference between 7,584 and 4,627 ?

```
 6 15 7 14
 7584
 4627
 ----
 2957
```

Explanation.—1. Write the less number under the greater, units under units, etc.

2. 7 units cannot be taken from 4 units. Take 1 ten from the 8 tens, leaving 7 tens ; change the 1 ten to units, making 10 units, which with the 4 units make 14 units. 7 units from 14 units leaves 7 units. Write 7 under the units.

3. 2 tens from 7 tens leaves 5 tens. Write 5 under the tens.

4. As 6 hundreds cannot be taken from 5 hundreds, take 1 thousand from 7 thousands, leaving 6 thousands ; change the 1 thousand to hundreds, making 10 hundreds, which with the 5 hundreds make 15 hundreds. 6 hundreds from 15 hundreds leaves 9 hundreds. Write 9 under the hundreds.

5. 4 thousands from 6 thousands leaves 2 thousands. Write 2 under the thousands. Answer, 2,957.

In practice, simply think the differences and write results ; thus, 7 from 14, **7** ; 2 from 7, **5** ; 6 from 15, **9** ; 4 from 6, **2**.

NOTE.—When the figure in the minuend is less than the one in the subtrahend 1 unit of the next higher order may be added to both the minuend and the subtrahend and the answer obtained, thus : 7 from 14, **7** ; 3 from 8, **5** ; 6 from 15, **9** ; 5 from 7, **2**. Answer, 2,957.

```
 1   1
 7584
 1   1
 4627
 ----
 2957
```

PROOF.—The remainder added to the subtrahend equals the minuend.

2. What is the difference between 5,000 and 467 ?

```
 4 9 9 10
 5000
  467
 ----
 4533
```

Explanation.—1. Write the less number, etc.

2. Take 1 from the 5 thousands of the minuend, leaving 4 thousands ; change the 1 thousand to hundreds, making 10 hundreds. Take 1 from the 10 hundreds, etc., making the minuend read 4 thousands, 9 hundreds, 9 tens, 10 units.

3. Then, 7 from 10, **3** ; 6 from 9, **3** ; etc. Answer, 4,533.

62. Find the remainders:

1.	2.	3.	4.	5.	6.
530	911	644	714	103	706
216	465	396	358	44	398

7.	8.	9.	10.	11.	12.
639	208	578	607	837	437
423	193	391	409	508	263

13.	14.	15.	16.	17.
3086	6008	7035	9003	8000
2347	2034	5948	512	537

18.	19.	20.	21.	22.
7035	4928	5029	7000	8507
3256	2763	3632	482	5036

23.	24.	25.	26.	27.
2000	5000	4004	9090	3000
181	409	327	607	33

28.	29.	30.	31.
8200007	6700000	4000052	6799990
99999	44444	1000062	499999

32. How much is 89,049 — 67,380? 95,941 — 67,444?

33. How much is 96,005 — 9,779? 84,004 — 7,810?

34. How much greater is 49,670 than 30,976? 80,976 than 79,191? 34,001 than 176?

35. How much less is 83,769 than 98,004? 37,245 than 80,612? 879 than 10,101? 6,747 than 8,700?

WRITTEN PROBLEMS.

63. 1. What number added to 6,724 will give 8,467?

2. What number taken from 11,111,111 leaves 99,999?

3. The sum of two numbers is 872, and one of the numbers is 388. What is the other number?

4. The difference of two numbers is 11,466, and the greater number is 50,000. What is the less number?

5. An empty vessel weighs 702 grains; filled with water it weighs 3,015 grains. What is the weight of the water it contains?

6. A man takes a bridge contract for $2,954, and expends on the construction $2,176. What is his profit?

7. Napoleon Bonaparte died in 1821 at 52 years of age. In what year was he born?

8. An estate of $12,340 had $1,857 of debts to be paid. What was its real value?

9. Subtract 231 from 1,160, 231 from the remainder, and so on, until the remainder is smaller than the subtrahend. What is the last remainder?

10. In the same manner subtract 306 from 1,272; 412 from 2,589; 643 from 4,936. What are the final remainders?

11. Two trains start from opposite ends of a road, 428 miles apart and move toward each other. After one has gone 189 miles, and the other 198, how far will they be apart?

12. The diameter of the earth is 7,912 miles; the diameter of the planet Jupiter is 88,390 miles. What is the difference between the two?

13. The greatest distance of the moon from the earth is 251,947 miles; the least distance is 225,719 miles. What is the difference between the two?

14. A bell composed of copper and tin weighs 2,152 pounds, and of this weight 1,614 pounds are tin. What is the weight of the copper in it?

MISCELLANEOUS PROBLEMS.

64. Oral Problems. 1. Ned carried 20 quarts of cherries to market. He sold 7 quarts to one man, 5 to another, 3 to another. How many quarts had he left ?

2. Mr. Briggs having $50, paid $25 for a cart, $7 for a plough, $10 for harness. How much had he left ?

3. Mrs. Wright had $3. She paid $1.60 for calico, 20¢ for cotton, 10¢ for thread, and 10¢ for buttons. How much change should she receive ?

4. How did the merchant count it out, using 50¢ pieces ?

5. Mr. Green had $100. He spent $65 for a cow and $7 for feed. How much had he left ?

6. Henry earned 50¢. He bought a 25¢ knife, a 5¢ top, and spent 5¢ for marbles. How much had he left ?

7. How did the clerk count out the change, using 5¢ pieces ?

8. A farmer sold wheat for $22, a calf for $6, butter for $3, and chickens for $2. He received flour and sugar worth $13. How much money was due him ?

65. Written Problems. 1. A man had $15 in bills and $4.75 in silver. He spent $7.25. How much money had he at first, and how much had he left ?

2. A dairyman paid $150 for a Jersey cow, $45 each for two other cows, and $12.50 for freight. What was the entire cost ?

3. Mrs. Shaw gave $43 for a cloak ; $33.50 for a dress ; $12.50 for a bonnet ; $3 for gloves ; $4.50 for shoes ; $2.50 for a parasol. What was the bill ? She gave in payment $100. What change should she receive ?

4. Mr. Rawson having $10,750, bought a house for $5,000, furniture for $2,500, horse and carriage for $1,250. How much money had he left ?

5. From the sum of 1,845 and 1,290 take their difference.

6. Mr. Young started business with $8,000. At the end of the first year he had gained $1,275. In the second year he lost $925. How much did he then have?

7. Mr. French owes his landlord $45 for rent and $27 borrowed money. He pays him $39. How much does he still owe?

8. A owes B $7,397; but B owes A $3,046. Which owes the more and how much?

9. Mr. Jenkins owed $1,500. He made the following payments: $375, $250 and $400. What does he still owe?

10. What is the sum of 1900 + 96 and 1900 − 96?

11. Mr. French bought groceries to the amount of $3.62. He gave the grocer a $5 bill. The grocer gave him two 50¢ pieces, one 25¢ piece, one 10¢ piece and 2¢. Was this the right change?

12. 5,000 + 25 less 5,000 − 25 = ?

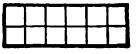
13. Edward's father taught him to keep an account of the money he received and the money he spent, as follows:

1888.		**Cash Account.**	Received.		Paid.	
Jan.	1	Received from Father,	$2	50		
	3	Sold my old skates,	1	15		
	"	Paid for new skates,			$2	25
	10	" " " knife,			1	60
	12	Uncle John gave me,	1	00		
	26	Broke glass next to school-house,				45
	31	Received from F. at various times, 5¢, 10¢, 5¢, 15¢,		35		

How much money did Edward have at the end of the month?

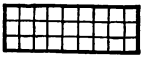
MULTIPLICATION.

66. 1. Charles sold 6 kites at 2 cents each. How much money did he receive for them?



2. Jane bought 5 spools of cotton at 3 cents a spool. How much money did she pay for the 5 spools?

3. Thomas walked 3 miles an hour for 9 hours. How far did he walk?



4. Margaret studied during five hours each day for 6 days. During how many hours altogether in the week did she study?

5. If a river flows 4 miles an hour, how far will it flow in 7 hours?

67. To **multiply** one number by another is to take the one number as many times as there are units in the other.

68. **Multiplication** is a short method of finding the sum of several equal numbers.

Thus: Henry earned $3 a day for 5 days. How much money did he earn in the 5 days together?

$3	
3	
3	
3	$3
3	5
$15	$15

Multiplication.

69. The **multiplicand** is the number to be repeated, or multiplied.

70. The **multiplier** is the number that shows how many times the other is to be repeated.

71. The **product** is the result obtained by multiplying.

$23	Multiplicand.
2	Multiplier.
$46	Product.

Thus: What will 2 tons of hay cost at $23 a ton?

72. The **sign of multiplication** is $\times$; it is read *times*, or *multiplied by*. Thus, 8×5 is read 8 *times* 5, or it may be read 8 *multiplied by* 5.

73. Explain by diagram, and copy:

3	3	3	3	3	3	3	3	3	3
1	2	3	4	5	6	7	8	9	10
3)3	3)6	3)9	3)12	3)15	3)18	3)21	3)24	3)27	3)30
1	2	3	4	5	6	7	8	9	10

NOTE.—The above and similar tables for the other digits should be constructed and frequently reviewed.

74. Copy, and complete the following table of products:

The number at the top is the number to be repeated or multiplied; the number at the left is the number by which to multiply. In each square is placed the product of the number at the top taken as many times as there are units in the number at the left of the diagram.

	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9									
4												
5												
6												
7												
8												
9												
10												
11												
12												

75. Oral Problems. 1. What will 6 pounds of sugar cost at 7 cents a pound?

2. What will 8 barrels of flour cost at $5 a barrel?

3. How much must Mr. Jacobs pay for 9 yards of cloth at $4 a yard?

4. At 7 miles an hour, how far will a horse trot in 6 hours?

5. In a peck there are 8 quarts; how many quarts are there in 9 pecks?

6. Frank works 8 hours a day; how many hours does he work in 6 days?

7. Grace read 5 hours every day; during how many hours did she read in 7 days?

76. Slate and Sight Exercises. Find products:

0	1	2	3	4	5	6	7	8	9	10
2	2	2	2	2	2	2	2	2	2	2

0	1	2	3	4	5	6	7	8	9	10
3	3	3	3	3	3	3	3	3	3	3

0	1	2	3	4	5	6	7	8	9	10
4	4	4	4	4	4	4	4	4	4	4

0	1	2	3	4	5	6	7	8	9	10
5	5	5	5	5	5	5	5	5	5	5

0	1	2	3	4	5	6	7	8	9	10
6	6	6	6	6	6	6	6	6	6	6

0	1	2	3	4	5	6	7	8	9	10
7	7	7	7	7	7	7	7	7	7	7

0	1	2	3	4	5	6	7	8	9	10
8	8	8	8	8	8	8	8	8	8	8

0	1	2	3	4	5	6	7	8	9	10
9	9	9	9	9	9	9	9	9	9	9

0	1	2	3	4	5	6	7	8	9	10
10	10	10	10	10	10	10	10	10	10	10

77. Find the cost of the following:

	Pounds.		Cents.		Bbls.		$		Yds.		Cents.
1.	7	@	9.	*5.*	9	@	5.	*9.*	6	@	9.
2.	6	@	5.	*6.*	7	@	6.	*10.*	8	@	8.
3.	8	@	7.	*7.*	5	@	8.	*11.*	7	@	7.
4.	4	@	9.	*8.*	8	@	9.	*12.*	5	@	7.

78. Make problems for the numbers in Art. 77.

Thus, Ex. 1: How much change should Mary receive, if she gives 7 dimes in payment for 7 pounds of crackers at 9 cents a pound?

79. Oral Problems. 1. If 4 ounces ($\frac{1}{4}$ of a lb.) of candy cost 10 cents, how much will a pound cost?

16 ounces (oz.) make 1 pound (lb.).

2. If a pint of milk costs 4 cents, what will be the cost of 2 gallons of milk?

3. Edgar gave 3 quarters of a dollar in payment for 9 quarts of berries at 7 cents a quart. How much change should he receive?

4. Frank bought fire-crackers and had 9 cents left, which was one-sixth of the money his father had given him. How much money had his father given to him?

5. What is the product of 6 times 7 — 2?

6. If half a peck of apples costs 10 cents, how much will a bushel cost?

7. Jane bought $8\frac{1}{2}$ yards of ribbon at 4 cents a yard. How much change should she receive if she gives in payment 7 nickels, or 5 cent pieces?

8. What is the product of 8 — 3 times 10 — 3?

9. How much will a dozen eggs cost at 4 cents each?

10. Which will cost the more, and how much, 8 pears at 5 cents each, or half a dozen oranges at 6 cents each?

80. To find the product when the multiplier is expressed by one figure.

1. Find the product of 2,435 multiplied by 9.

$$\begin{array}{r} 2,435 \\ 9 \\ \hline 21,915 \end{array}$$

Explanation.—1. Write the multiplier under the multiplicand, placing units under units.

2. 9 times 5 units are 45 units, or 4 tens and 5 units; write 5 under the units; and reserve the 4 tens to be added to the product of the tens.

3. 9 times 3 tens are 27 tens, which with the 4 tens make 31 tens, or 3 hundreds and 1 ten; write 1 under the tens, and reserve the 3 hundreds to be added to the product of the hundreds.

4. 9 times 4 hundreds are 36 hundreds, which with the 3 hundreds make 39 hundreds, or 3 thousands, and 9 hundreds; write the 9 under the hundreds, and reserve the 3 thousands to be added to the product of the thousands.

5. 9 times 2 thousands are 18 thousands, which with the 3 thousands make 21 thousands, or 2 ten-thousands, and 1 thousand; write the 1 under the thousands, and the 2 in the place for ten-thousands. Answer, 21,915.

NOTE.—In practice, simply think the products and write their unit figures adding the other figures to the next product; thus: 45—**5**; 27, 31—**1**; 36, 39—**9**; 18, **21**.

PROOF.—The product divided by the multiplier equals the multiplicand.

2.	**3.**	**4.**	**5.**	**6.**
3,427	5,209	6,075	8,723	5,236
6	7	4	5	8
7.	**8.**	**9.**	**10.**	**11.**
4,628	7,653	4,208	3,527	6,985
9	8	6	9	7
12.	**13.**	**14.**	**15.**	**16.**
6,504	9,008	8,089	7,765	8,909
7	9	8	9	7

81. Written Problems. 1. Thomas bought half a dozen melons at 25 cents each. What did they cost him?

2. How many days are there in 5 years, if there are 365 days in each of four years, and 366 days in the other year?

3. What cost 56 pounds of sugar at 9 cents a pound?

4. Mr. Jones sold 155 hats at $7 each. How much money should he receive?

5. How many pints are there in 55 gallons?

6. How much cost $5\frac{1}{2}$ dozen lemons at 2 cents each?

7. Henry sold 3 yards of brass wire at 1 cent an inch. How much did he charge for the wire?

8. How many inches are there in 9 yards?

9. Mr. Peck bought 8 city lots at $1,275 each. How much did they cost him?

10. Samuel earned $725 a year for 6 years. How much did he earn in all?

11. What will 9 dozen lead pencils cost at 3 cents for each pencil?

12. If a steamship travels 245 miles a day, how far will it travel in 9 days?

13. Mrs. Babbit bought a farm containing 7 acres of land at $1,175 an acre. How much did it cost her?

14. How many citizens did Chicago have, when it contained 6 times as many inhabitants as a city containing 85,425 citizens?

15. What number is 8 times as much as 12,525?

16. How much would a barrel of sugar weighing 280 pounds cost, at 8 cents a pound?

17. How many ounces are there in 8 pounds?

18. A coal merchant sold in one year 1,365 tons of coal at $7 a ton. What was the amount of his sales?

19. What is the entire value of 8 barrels of flour at $5.75 a barrel and 9 barrels of flour at $6.25 a barrel?

82. Read products, taking the numbers in any order:

2 ×	4	7	3	8	9	5	6	2
3 ×	7	8	6	9	2	4	5	3
4 ×	2	3	9	8	7	6	4	5
5 ×	6	7	5	4	8	3	2	9
6 ×	9	7	8	3	2	4	6	5
7 ×	8	6	4	9	3	7	5	2
8 ×	7	4	3	5	6	2	8	9
9 ×	4	8	2	6	3	5	9	7

83. Copy the following, and make an oral problem for each indicated product:

12 =

2 X 6	6 X 2
3 X 4	4 X 3

14 =

2 X 7	7 X 2

15 =

3 X 5	5 X 3

16 =

2 X 8	8 X 2
4 X 4	4 X 4

18 =

2 X 9	9 X 2
3 X 6	6 X 3

20 =

2 X 10	10 X 2
4 X 5	5 X 4

Thus, 2 × 6 ; 6 × 2 : If Frank earns $6 a week, how much will he earn in 2 weeks ? What will 6 yards of elastic cost at 2¢ a yard ?

84. Read products or squares:

1 × 1.	3 × 3.	5 × 5.	7 × 7.	9 × 9.	11 × 11.
2 × 2.	4 × 4.	6 × 6.	8 × 8.	10 × 10.	12 × 12.

The product of a number multiplied by itself is called its **square.**

85. Find the values of:

1 × 1 × 1.	3 × 3 × 3.	5 × 5 × 5.	7 × 7 × 7.	9 × 9 × 9.
2 × 2 × 2.	4 × 4 × 4.	6 × 6 × 6.	8 × 8 × 8.	10 × 10 × 10.

The product of a number taken three times as a factor is its **cube.**

86. Find the products:

1. **2** ×	2. **3** ×	3. **4** ×	4. **5** ×	5. **6** ×
4,728	5,609	2,782	7,068	8,763
2,096	4,078	6,098	9,847	6,547
3,545	7,663	4,317	8,679	5,084
7,217	8,702	7,266	5,864	4,470
9,684	9,095	5,572	2,978	7,268

6. **7** ×	7. **8** ×	8. **9** ×	9. **10** ×	10. **11** ×
5,607	6,295	4,956	3,706	8,423
7,853	5,386	6,578	2,960	7,085
6,427	4,378	7,632	4,752	6,920
4,536	2,695	5,827	5,006	5,432

87. To find the product when the multiplier is expressed by two figures.

1. Find the product of 203 multiplied by 38.

```
 203
  38
----
1624
609
----
7714
```

Explanation.—1. Write the multiplier under the multiplicand, placing units under units and tens under tens.

2. Multiply by the 8 in units' place. This gives the first partial product, 1,624 units. Write the 4 in units' place.

3. Multiply by the 3 in tens' place. This gives the second partial product, 609 tens. Write the 9 in tens' place.

4. Add the partial products. Answer, 7,714.

2.	3.	4.	5.	6.	7.
$2,068	$3,509	$2,683	$4,006	$3,908	$5,609
32	45	31	53	67	38

8.	9.	10.	11.	12.	13.
$60.53	$48.07	$92.36	$20.09	$68.50	$75.05
75	56	27	98	46	84

88. Read the numbers of which the following are the

Squares: 4, 9, 16, 25, 36, 49, 64, 81, 100; Cubes: 8, 27, 64, 125.

89. Copy, and complete the following table of factors:

22 =

2 X 11	11 X 2

24 =

2 X 12	12 X 2
3 X 8	X 3
4 X	6

27 =

X	X

28 =

X	X
X	X

30 =

X	X
X	X
X	X

32 =

X	X
X	

35 =

X	

36 =

X	

40 =

The numbers which, multiplied together, give the product are called its **factors** or *makers.*

The factors, such as 2, 3, 5, 7, 11, that cannot be separated into smaller factors are called **prime factors.**

90. Make, and fill similar diagrams for 26, 34, 38, 42, 44, 45, 46, 48, 49, 50, 54, 56, 60, 64, 72, and 81.

91. Written Problems. 1. What will be the cost of 125 yards of cloth, if a quarter of a yard costs 9 cents?

2. How much must Mr. Warren pay for 775 dozen lemons at $1\frac{1}{2}$ cents a lemon? (For one dozen, $12 \times 1\frac{1}{2}$ c. = ?)

3. What will be the cost of 125 boxes of grapes, each containing 8 pounds at $5\frac{1}{2}$ cents a pound? (One box, $8 \times 5\frac{1}{2}$ c. = ?)

4. In 7,652 pounds, 16 ounces each, how many ounces?

5. Mr. Brooks bought 25 sheep weighing on the average 136 pounds. What was their entire weight?

6. How many soldiers are there in 45 regiments each containing 925 men?

7. Mr. Jenkins bought 1,525 quart-baskets of strawberries at 12 cents a basket. How much was his bill?

8. What cost 1,258 dozen eggs, if each egg costs 2 cents?

9. Mr. Ronk sold 226 gallons of milk at 3 cents a pint. How much money should he receive?

10. What number is 59 times 7,283?

11. What cost 12,057 pieces of cloth at $96 a piece?

12. How many inches are there in 2,796 yards?

13. How much must Mrs. Brown pay for 27 tons of coal at $5.25 a ton?

14. Edward earns $4.75 a week. How much will he earn in 26 weeks?

15. At $3.37 a yard, what will 194 yards of cloth cost?

16. At $1.32 a bushel, what will 87 bushels of wheat cost?

17. What is the cost of three tubs of butter, weighing 48, 52, and 54 pounds, at 19 cents a pound?

18. How much will four pieces of muslin, containing 37, 29, 42, and 48 yards, cost at 18 cents a yard?

19. There are 24 hours in each day. How many hours are there in 4 months containing 31, 29, 31, and 30 days?

20. James worked in four months 20, 25, 18, and 22 days at 25 cents a day. How much did he earn?

21. What will groceries for one year cost at $18.25 a month?

22. How many hours are there in 3 years, counting 365 days to the year?

23. Martha spent $3.75 a day for 4 weeks of 7 days each. How much in all did she spend?

24. How many hours are there in nine years?

92. To find the product when the multiplier is expressed by any number of figures.

1. Find the product of 2,547 multiplied by 369.

Explanation.—1. Write the multiplier under the multiplicand, placing units under units, tens under tens, etc.

2. Multiply the multiplicand by the 9 in units' place in the multiplier; the product is 22,923 units. Write the first or right-hand figure of this product under the units.

3. Multiplying the multiplicand by the 6 in tens' place in the multiplier, the product is 15,282 tens. Write the first or right-hand figure of this product under the tens.

```
  2,547
    369
 22 923
15282
7641
939,843
```

4. Multiplying by the 3 in hundreds' place, the product is 7,641 hundreds. The first or right-hand figure of this product should be written under the hundreds.

5. Adding the *partial* products together gives the entire product Answer, 939,843.

2. Find the product of 4,056 multiplied by 207.

Explanation.—1. Write the multiplier under the multiplicand, placing units under units, etc.

2. Multiplying by 7 units gives 28,392 units for the first partial product.

3. As there are 0 tens in the multiplier, and as multiplying by 0 gives 0 for a product, the second partial product is omitted.

```
  4,056
    207
 28 392
8112
839,592
```

4. Multiplying by 2 hundreds gives 8,112 hundreds for the third partial product. Write 2, the first figure of this partial product, under the hundreds.

5. The sum of the partial products gives : Answer, 839,592.

3.	4.	5.	6.	7.
1,456	2,635	3,217	5,212	4,307
217	124	231	325	451

8.	9.	10.	11.	12.
2,784	8,527	5,639	7,238	18,265
463	342	526	654	427

13.	14.	15.	16.	17.
6,257	7,057	9,006	8,706	37,204
538	906	805	509	703

18.	19.	20.	21.	22.
24,632	32,041	78,709	58,403	87,004
1,708	6,059	7,006	9,075	9,876

93. To multiply when there are ciphers at the right of one or of both factors.

1. Find the product of 4,600 multiplied by 230.

```
  4,600
  230
 ------
 138
 92
 ------
1,058,000
```

Explanation.—1. Write the multiplier under the multiplicand, placing the first significant figure of the multiplier under the first significant figure of the multiplicand, and placing the ciphers at the right.

2. Multiply the multiplicand by the multiplier, as if there were no ciphers at the right of either factor, placing under each significant figure of the multiplier the first figure of its partial product.

3. Add the partial products and annex to their sum as many ciphers as there are at the right of the two factors together.

2.	3.	4.	5.	6.
6,560	5,440	7,700	8,600	9,800
340	600	550	400	70

7.	8.	9.	10.	11.
4,000	6,700	7,600	4,800	5,060
40	6,000	6,500	260	4,200

94. Find the products:

1. **864** ×	*2.* **450** ×	*3.* **890** ×	*4.* **7,800** ×	*5.* **9,060** ×
5,432	3,786	2,760	18,560	25,300
6,793	4,507	5,800	27,300	16,090
2,587	5,684	4,270	14,500	33,500
7,628	2,920	9,600	37,800	42,070
8,219	7,070	8,700	50,060	70,500

WRITTEN PROBLEMS.

95. 1. What is the value of 15 horses at $145 each?

2. Find the entire weight of a crop of cotton consisting of 133 bales of 475 pounds each.

3. Multiply forty thousand thirty-eight by three hundred seventy-six.

4. What number is 70 times as great as 7 × 17?

5. What will 3,100 acres of land cost at $27 an acre?

6. What is the square of 309; of 408; of 555; of 5,550?

7. What is the cube of 15; of 150; of 510; of 501?

8. What is the cost of 25 pieces of cloth, each piece containing 44 yards, at $3 a yard?

9. If the multiplicand is $915, and the multiplier 327, what is the product?

10. If each one of the 525 trees in an orchard yields 3 barrels of apples, and the apples are sold for $2 a barrel, how much money is received for the entire crop?

11. What will 64 miles of railroad cost at $12,750 a mile ?

12. A cargo of flour filling 18 cars was shipped to New York. Each car held 80 barrels and each barrel contained 196 pounds of flour. How many barrels of flour were there, and what was the weight of the flour ?

96. Find the product of:

1. $37.50 by 25.
2. $44.75 by 50.
3. 3,080 tons by 360.
4. 1,795 pounds by 730.

97. What is the value of:

1. 35 horses at $225 ?
2. 74 cows at $55 ?
3. 300 sheep at $3.50 ?
4. 500 tons of coal at $6.75?

98. Find the continued product of:

1. 123 × 456 × 789.
2. 505 × 606 × 707.
3. 3,570 × 206 × 100.
4. 813 × 308 × 400.
5. 375 × 864 × 1,000.
6. 8,005 × 404 × 500.

99. Find the cost of the following:

Groceries.

17 lb. (pounds)	of sugar	@ 8c,	.
20 "	" coffee	@ 28c,	.
5 "	" tea	@ 65c,	.
25 "	" flour	@ 4c,	.
30 "	" butter	@ 25c,	.
2 "	" raisins	@ 18c,	.
			$

Groceries.

4 quarts	of cranberries	@ 12c,	.
3 "	" onions	@ 5c,	.
6 gallons	" oil	@ 15c,	.
2 pecks	" potatoes	@ 25c,	.
3 bushels	" apples	@ $2,	.
5 quarts	" pears	@ 12c,	.
			$

Dry Goods.

25 yards	of calico	@ 5c,	
20 "	" gingham	@ 14c,	
45 "	" muslin	@ 10c,	
8 "	" cashmere	@ 75c,	
12 "	" cambric	@ 15c,	
35 "	" flannel	@ 60c,	
			$

Notions.

6 yards	of ribbon	@ 15c,	
5 "	" elastic	@ 3c,	
3 dozen	buttons	@ 30c,	
4 spools	of silk	@ 9c,	
5 papers	of needles	@ 5c,	
9 yards	of lace	@ 18c,	
			$

100. Copy, and complete the following bills:

NEW YORK, *May* 1, 1888.

MR. RALPH RODGERS,

Bought of EDGAR ALLEN.

5 lb. Sugar, ...	@ 6¢		30
25 " Flour, ...	@ 4¢	1	
7 " Nails, ...	@ 5¢		
		$	

RICHMOND, *Jan.* 1, 1888.

MR. HENRY YOUNG,

Bought of WILLIAM PERKINS.

130 bu. Wheat, ...	@ $.96		
75 " Potatoes, ...	@ .87		
93 " Corn, ...	@ .42		
		$	

MISCELLANEOUS PROBLEMS.

101. Oral Problems. 1. George earns $5 a week and Henry, $6 a week. What do they together earn in 11 weeks?

2. What is the sum of 5 × 8 and 4 × 5? What is their difference?

3. What is the product of 6 + 5 multiplied by 17 − 8?

4. How much more is 8 dozen and 4 than 7 dozen and 6?

5. What is the cost of 7 pounds of rice at 7 cents and 3 pounds of raisins at 10 cents?

6. What is the difference between the cost of 2 pounds of tea at 50 cents and 10 pounds of sugar at 7 cents?

7. If I buy 7 pounds of prunes at 12 cents a pound, what change do I receive from $1?

8. How many trees are there in 10 orange groves, if each of them has 10 rows of trees and each row has 10 trees?

9. What are the factors of 25? Of 26? Of 27? Of 40? Of 42?

10. What are the two equal factors whose product is 16?

11. What other numbers are the product of two equal factors?

12. What are the factors of 30? Of 42? Which of these factors are the same in both numbers?

13. Harry spends each week $4 of his weekly wages of $6. How much does he save in 12 weeks?

14. Lucy has 15 cents and Mary has 10 cents more than twice as much. How much money has Mary, and how much have they both?

102. Written Problems. 1. How much more would 19 cows at $45 a head cost than 29 sheep @ $5 a head? What would they cost altogether?

2. Mr. Edwards bought 314 acres of land at $65 an acre, and sold it for $21,000. How much was gained?

3. If a man saves $15 each month, how much will he save in 10 years?

4. Mr. Macy bought 500 acres of land at $25 an acre; he sold 300 acres at $40 and 200 acres at $30. How much did he gain?

5. A farmer having $3,000, bought 45 acres of land at $50 an acre, 5 cows at $42 each, and a horse for $155. How much money did he have left?

6. Mr. Price gave a $10 bill in payment for 7 pairs of skates @ $1.25 each. How much change should he receive?

$1.25	$10.00
7	8.75
$8.75	$1.25 Ans.

7. A farmer bought 30 bushels of seed wheat @ $1.40 and paid for it with a $50 bill. How much change was due him?

8. Mr. Brown sold 45 yards of muslin @ 12 cents a yard. He received in payment three $2 bills. How much change should he return ?

9. Frank had to travel 100 miles. He walked 24 miles a day for 3 days. How far had he still to travel ?

10. Mrs. James bought from Homans & Co. 4 yards of silk at $1.50 a yard ; 3 yards of lace at $.75 a yard ; and 10 yards of ribbon at $.35 a yard. She gave in payment two $5 bills, one $1 bill, and two 50-cent pieces. Make out the bill and find what change is due.

11. Shepard & Tompkins sold Mr. Jennings 9 pounds of nails at 5 cents a pound, 4 hammers at 60 cents, and 3 planes at 75 cents. Make out the bill and find how much change is due Mr. Jennings, who gave in payment two $2 bills and two $1 bills.

12. Mr. James Lee earned in three months $365, $735, and $500. He spent $1,000, and divided the money he had left equally between 5 creditors. How much did he give to each creditor ?

13. A jeweller sold 2 clocks at $15, 3 chains at $12, and 5 rings at $6 ; in exchange he received 2 watches of equal value. How much was each watch worth ?

14. If from a certain number 786 is subtracted, the remainder is 5,214. What is the number ?

15. A grocer bought 120 bushels of potatoes at 60 cents a bushel. He sold half of them at 70 cents and the other half at 75 cents a bushel. What was his entire profit ?

16. A gentleman bought a saddle horse for $180, and a pair of horses each costing one-half more than the saddle horse. How much did he pay for the three horses ?

17. What is the result, if seventy thousand seventy be multiplied by seven thousand seven hundred, and the product be subtracted from seven hundred million ?

DIVISION.

103. 1. Mr. James bought 8 books for \$72. How much did each book cost him ?

2. Martha paid 63 cents for ribbon at 7 cents a yard. How many yards of ribbon did she buy ?

3. If a train travels 80 miles in 4 hours, how many miles per hour does it travel ?

4. Matthew sold 9 newspapers for 36 cents. How much did he receive for each paper ?

104. To **divide** one number by another is to find how many times the one number contains the other.

105. Division is a short method of finding how many times one number can be subtracted from another.

Thus : How many hats at \$5 each can be bought for \$15 ?

\$15 – \$5 – \$5 – \$5 ; or $\begin{array}{r} \$5)\$15 \\ \hline 3 \end{array}$.

106. The **dividend** is the number to be divided.

107. The **divisor** is the number by which to divide.

108. The **quotient** is the result obtained by dividing.

Divisor.	Dividend.
\$4)	\$48
Quotient.	12

Thus : At \$4 a day, in how many days will a man earn \$48 ?

109. The sign of division is ÷ ; it is read *contains,* or *divided by.* Thus, 56 ÷ 7 is read 56 *contains* 7, or 56 *divided by* 7.

110. Copy and explain by diagram :

4	4	4	4	4	4	4	4	4	4
1	2	3	4	5	6	7	8	9	10
4)4	4)8	4)12	4)16	4)20	4)24	4)28	4)32	4)36	4)40
1	2	3	4	5	6	7	8	9	10

111. Construct, in review, similar tables for the other digits.

112. Slate and Sight Exercises. Find quotients:

2)4	2)6	2)8	2)10	2)12	2)14	2)16	2)18	2)20
3)6	3)9	3)12	3)15	3)18	3)21	3)24	3)27	3)30
4)8	4)12	4)16	4)20	4)24	4)28	4)32	4)36	4)40
5)10	5)15	5)20	5)25	5)30	5)35	5)40	5)45	5)50
6)12	6)18	6)24	6)30	6)36	6)42	6)48	6)54	6)60
7)14	7)21	7)28	7)35	7)42	7)49	7)56	7)63	7)70
8)16	8)24	8)32	8)40	8)48	8)56	8)64	8)72	8)80
9)18	9)27	9)36	9)45	9)54	9)63	9)72	9)81	9)90
10)20	10)30	10)40	10)50	10)60	10)70	10)80	10)90	10)100

113. Oral Problems. 1. Arthur earned $9 per week. In how many weeks would he earn $81 ?

2. Mr. Briggs had 7 volumes of a history that cost him $63. How much did each volume cost him ?

3. If it costs $27 to carpet a hall with carpet at $3 per yard, how many yards of the carpet are required ?

4. How many gallons of water are there in a tank containing 36 quarts of water ?

5. Charles caught 8 fish together weighing 16 pounds. What was the average weight of the fish ?

6. If a bin contains 36 pecks of potatoes, how many bushels of potatoes are there in the bin ?

7. How many dresses containing 9 yards each can be made from 54 yards of calico ?

114. Of which of the numbers in Arts. 112 and 115 is 2 a common divisor? Of which is 3 a common divisor? Of which are 4, 5, 6, 7, 8, and 9 common divisors?

A number that divides two or more numbers without a remainder is called their **common divisor.**

115. Read quotients at sight:

2	8	14	4	16	10	2	18	12	24	6	22	20
3	12	6	24	3	21	30	9	27	36	15	33	18
4	20	28	12	48	16	44	4	40	24	32	8	36
5	15	40	25	55	5	60	30	50	10	20	45	35
6	24	54	18	48	30	66	42	60	6	72	36	12
7	14	42	63	7	84	77	49	21	56	28	70	35
8	32	64	24	80	56	40	88	72	16	96	48	8
9	27	63	18	81	108	54	90	9	36	99	72	45
10	50	30	120	80	110	20	100	60	40	90	10	70
11	77	55	99	33	121	66	22	110	88	44	132	11
12	48	96	12	72	120	144	36	132	60	24	108	84

Each number in the first column at the left is a divisor for all the numbers on a line with it at its right.

116. Copy, and complete:

12 =

x	x
x	x

14 =

x	x

15 =

x	x

16 =

x	x
x	x

18 =

x	x
x	x

20 =

x	x
x	x

117. Find the number of items bought for each of the following sums:

Per Pound.	Per Barrel.	Per Yard.
1. \$.45 @ 5¢.	*1.* \$81 @ \$9.	*1.* \$.56 @ 8¢.
2. \$.96 @ 8¢.	*2.* \$108 @ \$12.	*2.* \$.72 @ 9¢.
3. \$.63 @ 9¢.	*3.* \$64 @ \$8.	*3.* \$.48 @ 6¢.
4. \$.54 @ 6¢.	*4.* \$84 @ \$7.	*4.* \$.96 @ 12¢.

118. Find the price per item in each of the following:

Quarts.	Yards.	Books.
1. 9 for \$.36.	*1.* 6 for \$.42.	*1.* 4 for \$.48.
2. 7 " \$.49.	*2.* 8 " \$.72.	*2.* 3 " \$.27.
3. 6 " \$.48.	*3.* 9 " \$.63.	*3.* 7 " \$.56.
4. 7 " \$.63.	*4.* 8 " \$.40.	*4.* 9 " \$.81.

119. Make problems for the numbers in Arts. 117 and 118.

120. Oral Problems. 1. How many yards are there in 12 feet? In 18 feet? In 24? In 36?

2. How many feet are there in 24 inches? In 36 inches? In 48? In 60? In 84?

3. At \$6 a cord, how much wood can be bought for \$24? For \$42? For \$72?

4. If a horse trots 8 miles in one hour, in how many hours will it trot 32 miles? 64 miles?

5. How much cloth at \$5 a yard can be bought for \$35? For \$45? For \$55?

6. At 12 cents a pound, how many pounds of sugar can be bought for \$.48? \$.72? \$.96?

7. How many gallons are there in 16 quarts? In 24 quarts? In 44 quarts?

8. If \$60 pays for 12 cords of wood, how much does one cord cost?

9. A field of oats can be reaped by 63 men in one day. How many men can reap the field in 9 days?

10. How many barrels of flour can be bought for $84 at $7 a barrel? At $12?

11. In what time will two boats meet, if they are 50 miles apart, but travelling toward each other, one at the rate of 6 miles an hour, and the other at the rate of 4 miles an hour?

12. How long will it take a ship travelling 20 miles an hour to overtake another ship travelling in the same direction 10 miles an hour, if they are 100 miles apart?

13. A piece of work requires 48 days' labor. If there are 8 men, how many days must they labor to do the work?

14. If a wall can be built by 54 days' labor, how many men will be required to do the work in 6 days? In 9 days?

15. If a wheel has a tire or outer rim of iron 9 feet long, how many times will the wheel turn around in going 81 feet? In going 90 feet?

16. If milk is 8 cents a quart, how many quarts can be bought for 96 cents? For 88 cents?

17. For $1.32 how many copy-books can be bought at 11 cents each? At 12 cents each?

18. Martha saved 10 cents a week. In how many weeks could she save $1.20? $1.10? $1?

19. John had $1.08, and with it bought a dozen slates. How much did each slate cost him?

20. How many dozen oranges at 6 cents for each orange can Henry buy for $.72? For $.36?

21. Joseph sold kites at 5 cents each. How many kites must he sell to receive $.60? $.55?

22. Mr. Jones buys coats for $12 and sells them for $15. How many coats must he sell to gain $21?

23. Mr. Macy bought a dozen hats for $60. How much did each hat cost him?

24. How much will each button cost, if a dozen buttons cost $.84? $.96? $1.44?

25. In running a race Howard gains 5 feet on Robert every minute. How long will it take him to gain 30 feet? 300 feet? 150 feet?

26. James spent in car fare $.72 in a week of 6 working days. How much car fare did he spend each day?

27. Martha spent $1.08 for a dozen spools of sewing silk. How much did each spool cost?

28. The minute hand of a clock moves 12 times as fast as the hour hand. How far does the hour hand move while the minute hand is moving 60 minutes?

29. Sarah bought 11 yards of gingham for $1.32. What did it cost her a yard?

121. Read at sight the number of times:

in	in	in	in	in	in
4)24	**5**)25	**6**)30	**7**)42	**8**)24	**9**)18
36	50	42	35	56	54
44	20	24	49	80	99
16	40	36	63	32	36
28	15	48	28	72	90
20	35	72	56	48	72
32	45	18	77	96	27
12	55	66	70	88	81
40	30	54	21	40	63
48	60	60	84	64	45

122. Read the number of times, and the remainder, in each of the following:

in
3)6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20.
4)6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20.
5)6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20.

Read the first line thus: 2, 2 and 1 over, 2 and 2 over, 3, 3 and 1 over, etc.; the second line: 1 and 2 over, 1 and 3 over, etc.

SHORT DIVISION.

123. To find the quotient when the divisor is not greater than 12.

1. Find the quotient of 6,858 divided by 9.

$$\begin{array}{r} {\scriptstyle 5\ \ 1} \\ 9)\underline{6,858} \\ 762 \end{array}$$

Explanation.—1. Write the divisor at the left of the dividend with a curved line between them; and draw a straight line under the dividend.

2. 9 is contained in 68 hundreds 7 hundred times, with 5 hundreds remainder. Write 7 under the hundreds.

3. The 5 hundreds remainder with 5 tens make 55 tens. 9 is contained in 55 tens 6 times with 1 remainder. Write 6 under the tens.

4. The 1 ten remainder with 8 units make 18 units. 9 is contained in 18 units 2 unit times. Write 2 under the units. Answer, 7 hundreds, 6 tens, and 2 units, or 762.

NOTE.—In practice, simply: 9 in 68, **7**; in 55, **6**; in 18, **2**.

PROOF.—Multiply the quotient by the divisor; add the remainder, if any, to the product; the result should equal the dividend.

2. Find the quotient of 7,308 divided by 12.

$$\begin{array}{r} {\scriptstyle 1\ \ 0} \\ 12)\underline{7,308} \\ 609 \end{array}$$

Explanation.—1. Write the divisor at the left of the dividend, etc.

2. 12 is contained in 73 hundreds 6 times with 1 hundred remainder. Write 6 under the hundreds.

3. The 1 hundred remainder with 0 tens makes 10 tens. 12 is not contained in 10 tens. Write 0 under the tens.

4. The 10 tens with 8 units make 108 units. 12 is contained in 108 units 9 unit times. Answer, 6 hundreds, 0 tens, 9 units, or 609.

3.	**4.**	**5.**	**6.**	**7.**
8)6,584	7)14,602	6)25,236	9)33,003	8)40,504
8.	**9.**	**10.**	**11.**	**12.**
10)70,840	11)45,210	12)50,640	12)37,248	11)59,433

124. Find the quotients:

8)106,456	**9**)108,927	**7**)14,203	**8**)45,304
73,640	35,073	68,516	72,008
49,784	270,567	9,807	8,504
173,536	58,401	72,541	52,064
54,024	117,342	8,638	4,008
10)75,400	**11**)27,203	**12**)36,204	**9**)29,405
9,280	6,545	8,076	47,061
16,750	38,071	16,380	53,577
8,300	7,865	5,400	16,083
15,590	22,572	27,060	2,871

125. Read at sight the quotients and remainders obtained by dividing each of the following numbers taken in any order by each of the digits beginning with 4:

10	20	30	40	11	21	31	41
12	22	32	42	13	23	33	43
14	24	34	44	15	25	35	45
16	26	36	46	17	27	37	47
18	28	38	48	19	29	39	49

126. Read the quotients and remainders obtained by dividing the numbers in each of the following lines by the divisor at its left, and by each succeeding divisor to 12.

in										
5)	50	51	52	53	54	55	56	57	58	59
6)	60	61	62	63	64	65	66	67	68	69
7)	70	71	72	73	74	75	76	77	78	79
8)	80	81	82	83	84	85	86	87	88	89
9)	90	91	92	93	94	95	96	97	98	99
10)	100	101	102	103	104	105	106	107	108	109
11)	110	111	112	113	114	115	116	117	118	119
12)	120	121	122	123	124	125	126	127	128	129

127. Copy, and complete, writing before each pair of numbers the greatest common divisor of those numbers:

8	$\frac{8}{24}$	$\frac{3}{9}$	$\frac{5}{10}$	$\frac{4}{6}$	$\frac{6}{8}$	$\frac{6}{9}$	$\frac{6}{12}$	$\frac{7}{14}$
	$\frac{30}{10}$	$\frac{40}{8}$	$\frac{50}{25}$	$\frac{50}{10}$	$\frac{16}{24}$	$\frac{9}{36}$	$\frac{7}{21}$	$\frac{18}{45}$

128. A number that contains another number as one of its factors, or as a divisor without a remainder, is called a **multiple** of that number.

It is a number obtained by *multiplying* the other numbers. Thus: 6, 8, 10, 12, etc., are *multiples* of 2, being 3, 4, 5, 6, etc., times 2; 3, 6, 9, 12, 15, etc., are *multiples* of 3.

129. A number that contains two or more numbers as factors, or exact divisors, is called their **common multiple.**

Thus: 14 is a *common multiple* of 2 and 7; 15, of 3 and 5.

130. The least number that contains two or more numbers as factors or divisors is called their **least common multiple.**

Thus, 12 is the least common multiple of 2, 3, 4, and 6; 14, of 2 and 7; 16, of 2, 4, and 8; and 18, of 2, 3, 6, and 9.

131. Copy, and complete, writing after each set of numbers their least common multiple:

2		3		4		2	3	4	2	3
3	6	4	12	5	20	5	5	6	6	6
2		3		2		2	2	3	3	6
3	12	4	12	4		4	6	6	4	8
4		6		6		8	8	8	12	12
5		4		3		6	5	6	8	9
6		7		8		8	9	10	10	12

132. Copy, and complete, writing least common multiples:

L. c. m. of	L. c. m. of	L. c. m. of
2, 3 is 6	2, 3, 4 is 12	4, 5 is
2, 4 is 4	2, 3, 6 is	4, 7 is
3, 4 is	3, 4, 6 is	5, 8 is
3, 5 is	3, 6, 9 is	6, 10 is

LONG DIVISION.

133. Inductive Oral Problems. 1. How many city lots at $380 can be bought for $500?

The divisors and the dividends are considered each as the nearest number of tens, hundreds, or thousands, and then the quotient is found as in dividing one digit by another. Disregard the remainders.

2. If Mary has $2.00, how many books at $.96 each can she buy?

3. Mr. Henry has $18,500. How many houses costing $7,200 each will his money purchase?

4. Frank had $.60 with which to buy drawing books. The books cost $.18 each. How many could he buy?

5. Mrs. Lamb had $4.00. How many barrels of potatoes at $.90 a barrel could she buy?

6. At $5.25 a barrel, how many barrels of flour can be purchased with three $10 bills?

7. At $6.75 a pair, how many pairs of shoes can be bought for $22.00?

8. If readers are worth $.48 each, how many can be bought for $2.50?

9. For how many passengers at $8.50 each will $90 pay?

10. How many tons of coal at $5.75 can be bought for $50? For $60? For $18?

11. At $.75 a dozen, how many dozen rose buds can be bought for $5.00? For $3.25?

134. Read the quotients, but not the remainders, in the following:

20)52	**32**)40	**41**)42	**39**)41	**18**)40
37	60	82	80	60
89	65	81	67	42
76	63	75	91	32
81	65	83	78	79
99	95	98	95	90

Thus: consider 18 as 2 tens and then divide 4, 6, 4, 3, 8 and 9 tens successively by 2 tens. The divisor thus considered is called a *trial divisor.*

135. Read the quotients, but not the remainders, in the following:

105) 525	**210**)440	**407**)408	**507**)614
650	664	829	963
840	758	814	1460
930	886	811	2020
606) 608	**425**)430	**396**)346	**295**)276
1212	849	490	605
1015	852	889	822
1815	837	1125	970

In dividing by 407, close inspection shows that while of 829 and 814, each contains the divisor 2 times, 811 contains it but once.

136. Read at sight quotients only:

How many times	How many times	How many times
1. \$.05 in \$.23 ?	*7.* \$1.20 in \$6.50 ?	*13.* \$1,010 in \$2,500 ?
2. \$.25 in \$.80 ?	*8.* \$1.25 in \$2.75 ?	*14.* \$1,800 in \$4,000 ?
3. \$.50 in \$1.75 ?	*9.* \$2.10 in \$15.00 ?	*15.* \$2,135 in \$9,500 ?
4. \$.40 in \$.90 ?	*10.* \$1.95 in \$14.00 ?	*16.* \$3,975 in \$16,000 ?
5. \$.40 in \$1.00 ?	*11.* \$2.05 in \$16.00 ?	*17.* \$4,907 in \$25,000 ?
6. \$.30 in \$1.60 ?	*12.* \$4.50 in \$10.00 ?	*18.* \$5,001 in \$25,000 ?

137. To find the quotient when the divisor is expressed by any number of figures.

1. Find the quotient of 512,440 divided by 102.

```
        5 023
102)512,440
    510
      244
      204
       400
       306
        94
```

Explanation.—1. Write the divisor at the left of the dividend with a curved line between them. Draw above the dividend a straight line above which to write the quotient.

2. 102 is contained in 512 (thousands) 5 times with 2 remainder. Write 5 in the quotient above the thousands and 2 as a remainder under the thousands.

3. The 2 thousands with the 4 hundreds of the dividend make 24 hundreds. 102 is not contained in the 24 (hundreds). Write 0 in the quotient over the hundreds.

4. The 24 hundreds with the 4 tens of the dividend make 244 tens. 102 is contained 2 times with a remainder of 40 tens. Write 2 in the quotient over tens.

5. The 40 tens remainder with the 0 units of the dividend make 400 units. 102 is contained in 408 units 3 times with 94 units remainder. Write 3 in the quotient over the units. Answer, 5 thousands, 0 hundreds, 2 tens, and 3 units, or 5,023, with a remainder of 94.

NOTE 1.—If any partial product is greater than the partial dividend, the quotient is too great, and a smaller number for the quotient must be tried.

```
  762
9)6858
  63
   55
   54
    18
    18
```

NOTE 2.—The examples on pp. 123 and 124 may be worked in the same form.

PROOF.—Multiply together the quotient and the divisor, and to the product add the remainder. The result must equal the dividend.

2.	3.	4.	5.	6.
25)526	39)412	42)579	61)834	89)910

7.	8.	9.	10.	11.
37)5,469	45)6,078	53)81,604	42)90,842	39)93,007

12.	13.	14.	15.	16.
78)80,096	64)65,009	81)82,970	87)88,872	95)49,723

17.	18.	19.	20.
608)709,407	527)634,269	891)963,540	725)800,000

138. Find the quotients:

1. **58** in	*2.* **95** in	*3.* **236** in	*4.* **370** in	*5.* **4,006** in
7,604	9,684	8,075	35,284	800,563
5,968	8,507	4,563	55,078	401,781
3,074	3,069	2,709	64,206	927,654
6,953	6,845	9,006	23,069	536,081
9,081	1,207	7,458	46,208	782,053

139. To divide when there are ciphers at the right of the divisor.

1. Find the quotient of 240,635 divided by 1,200.

12|00)240,6|35
20 0 +
rem. 635

Explanation.—1. As the significant figures of the divisor are not greater than 12, write the numbers as in short division.

2. Mark off the ciphers at the right of the divisor and mark off an equal number of figures at the right of the dividend. This, without affecting the answer, reduces the work to dividing 2,406 hundred + by 12 hundred.

3. Divide 2406 by 12. Answer, 200 with 635 remainder.

2.	3.	4.	5.
800)63,745	700)85,090	90)73,054	60)58,040

6.	7.	8.	9.
50)75,060	40)92,600	300)72,000	2,000)950,000

10.	11.	12.	13.
230)6,200	340)40,500	7,800)69,050	540)780,600

140. Find the quotients:

480)82,600	**3,080**)606,500	**40,600**)8,196,500
76,540	472,660	6,073,420
92,386	305,428	5,783,267
54,370	206,530	4,530,000
60,500	907,000	3,007,060

WRITTEN PROBLEMS.

141. 1. If a train travels 45 miles an hour, in how many hours will it travel 1,575 miles?

2. A planter made 62 bales of cotton weighing 27,900 pounds. What was the average weight of a bale?

3. How long will 4,968 barrels of flour last an army using 108 barrels each day?

4. Mr. Johnson bought 67 acres of land for $1,340. How much did he pay for an acre?

5. If an army of 58,368 men is divided into 96 regiments, what is the average number of men in a regiment?

6. How many days will a ship be in sailing 7,000 miles, if it sails 125 miles every day?

7. What is the number of barrels required to hold 14,700 pounds of flour, if each barrel holds 196 pounds?

8. A farmer gathered 19,500 bushels of corn from 300 acres. How many bushels an acre did the land yield him?

9. How many square miles are there in a farm containing 59,520 acres, each square mile containing 640 acres?

10. If a page of 36 lines of printed matter contains 2,052 letters, how many letters does each line average?

MISCELLANEOUS PROBLEMS.

142. Oral Problems. 1. If John earns $27 in 3 weeks, how many dollars can he earn in 1 week? In 2 weeks? In 4 weeks? In 5 weeks?

2. Edward earned $54 in 6 weeks. How many dollars can he earn in 8 weeks?

3. If 7 pounds of raisins cost 63 cents, what will 9 pounds cost? What will 12 pounds cost?

4. A wall was built by 8 men in 7 days. How long would it have taken one man to build the wall?

5. If 6 men can dig a trench in 8 days, how long will it take one man to dig the trench? How long will it take 4 men to dig the trench?

6. How long will it take 4 men to pick as many berries as 6 men can pick in 6 days?

7. What will be the cost of a bushel of apples, if half a peck costs 12 cents? 20 cents?

8. How many gallons of milk can be bought for 32 cents, if a pint costs 4 cents?

9. How much will $2\frac{1}{2}$ pecks of berries cost, if a quart costs 5 cents?

10. Mary bought $3\frac{1}{2}$ yards of lace at 8 cents a yard. How much change should she receive, if she gives in payment a twenty-five cent piece and a five-cent piece?

11. Charles had 50 miles to travel. How far did he still have to travel after riding 6 miles an hour for $7\frac{1}{2}$ hours?

12. How many tons of coal can be bought for $48, if 9 tons cost $54?

13. A piece of cloth contained 48 yards. How many yards were left in the piece after 5 dress patterns of 9 yards each had been cut off?

14. James in helping his father sold 8 pounds of crackers at 5 cents a pound. He received $1 and gave in change a half dollar and a quarter. What should he have given?

15. Which is the greater, and how much, 8×9, or 6×12?

16. What will 12 tons of coal cost, if 7 tons cost $42?

17. Richard earned $6 a week for 7 weeks and his father gave him $8. How many dollars did he have left after paying $5 a week board for 7 weeks?

18. How much does a grocer make on a pound of sugar, if he sells for 30 cents 6 pounds of sugar that cost him 4 cents a pound?

19. Ned buys 12 newspapers at 2 cents each and sells them all for 36 cents. What did he make on each paper?

20. Sarah bought half a dozen eggs at 3 cents each and half a pound of cheese at 16 cents a pound. How much change should she receive after giving the grocer two twenty-five cent pieces?

21. Mr. Greene sold $2\frac{1}{2}$ yards of ribbon at 20 cents a yard, and 5 spools of silk at 8 cents a spool. What change should he return to the customer who had given him one dollar?

143. Written Problems. 1. If the profits of a street railroad are $15,276 every 3 weeks, how much would they be in 7 weeks? What would they be in a year, or 52 weeks?

2. A gas company makes $6,300 profits in 4 weeks. What does it make in a year, or 365 days, at the same rate?

3. If 63 tons of coal sell for $378, how many tons can be bought for $9,876?

4. If 345 men can build a railroad in 96 days, how long would it take one man to build the road? How long would it take 32 men?

5. If 75 barrels of flour are sold for $525, for how much should 1,738 barrels of flour be sold?

6. A merchant bought 725 barrels of apples at $5.25, 323 barrels of potatoes at $1.75, and 600 watermelons at 24 cents. He paid $2,500 cash and gave his note for the rest. For how much did he give his note?

7. How many quarts of milk were there in a car containing 50 cans, each holding 5 gallons? How much was the milk worth at 6 cents a quart?

8. What is the value of 150 pieces of cloth, each containing 42 yards at $1.35 a yard?

9. From $68 \times 2,345$ take $59 \times 1,906$; how many remain?

10. How many dollars per mile will a railroad cost, if it is 81 miles long and costs $275 less than $5,000,000?

11. If the divisor is 8,604 and the quotient 378, what is the dividend?

12. The divisor is 75; the quotient, 38; and the remainder, 62. What is the dividend?

13. The product is 95,533, and the multiplier 83. What is the multiplicand?

14. Mr. Edwards bought 5 city lots for $1,265; $3,250; $2,575; $1,987; $2,638. He gave in part payment a $10,000 bill. How much did he then owe?

15. What will be the united value of 500 horses at $125 each, 400 cows at $25, 325 sheep at $4, and 200 chickens at 10 cents?

16. Sound travels 1,090 feet in a second. How far will it travel in 1 minute, or 60 seconds?

17. If each freight car weighs 24,080 pounds, and the engine 140,000 pounds, what is the weight of a train of 5 cars and the engine?

18. A land company spent $24,375 for 975 acres. What was the price per acre?

19. A drover bought 238 hogs at $8, and 732 sheep at $3. How much did he pay for all?

20. He sold the hogs at $6 and the sheep at $5. Did he gain or lose, and how much?

21. How long would it take a train to go 25,000 miles, or around the world, going 625 miles a day?

22. In one year there are 52 weeks. How many years are there in 3,796 weeks?

23. The distance to the sun is about 93,000,000 miles. How long would it take a train running 620 miles a day to go that distance?

24. An army of 6,500 men consume 6,500 rations per day. How long will 1,267,500 rations last the army?

25. A manufacturer drew from bank $937 to pay some workmen. He paid a certain number $25 each, and found he had $12 remaining. How many workmen did he pay?

26. A man sold property for $4,732, and took in payment 52 shares of railway-stock. What was the value of each share?

27. A farmer sold 27 cords of wood at $5, and 47 hundredweight of tobacco at $7. He took in payment flour at $8 a barrel. How many barrels did he receive?

28. Two trains start at 10 A.M. from two points 448 miles apart on a railway, and move towards each other, each with an average speed of 28 miles an hour. At what time will they meet?

29. A gentleman left property to the amount of $20,000. He ordered by his will that, after paying his debts, amounting to $1,990, and a legacy of $720 to a charity, the rest should be equally divided among his seven children. How much would each child receive?

30. A farmer exchanged 275 bushels of wheat at $1.00 a bushel for 500 bushels of corn. What did the corn cost him a bushel?

31. A man had $3,000. He spent $1,800 for land; bought 6 horses at $125, and 8 cows at $45. How much money did he have left?

32. If 5 bushels of wheat yield 196 pounds of flour, how much flour will 775 bushels yield?

33. If 8 tons of coal cost $48, how much can I buy for $756?

34. If flour is worth 4 cents a pound, how much must be paid for 50 bags of 25 pounds each?

35. A drover exchanged cattle at $36 a head for 48 horses at $177 a head. How many head of cattle did he give?

36. A man with an income of $2,000 per year spent $500 for rent, $775 for food, $22 for wages, $325 for clothing. How much had he left?

37. If Mr. Baker buys 12 pounds of sugar for $.95; 6 pounds of coffee for $1.50, and 25 pounds of flour for $1.25, how much change should he receive on paying with $5?

38. A man earns $1,200 a year and spends $3 a day. How much will he save in one year?

39. If 42 bushels of oysters are collected each day by the men owning an oyster boat, how long will they be in gathering 504 bushels? What will be the value of the oysters at 65 cents a bushel?

40. A divisor is 271, and the quotient is 39. What is the dividend?

41. A remainder is 725, and the subtrahend is 4,328. What is the minuend?

42. A product is 5,325, and one factor or multiplier is 75. What is the other factor or multiplier?

43. What number taken from 2,936 will leave 1,233?

44. What number divided by 325 will give 229 as a quotient?

45. The divisor is 128, the quotient 49, and remainder 97. What is the dividend?

46. What number added to 4,328 will give 8,369 ?

47. A man earns $150 a month and spends $122 a month. How long will it take him to save $560 ?

48. Mr. Brown gained $375 by selling 75 head of cattle at $25 a head. How much did they all cost him ?

49. There are 1,760 yards in a mile. How many miles are there in 329,480 yards ?

50. A merchant sold 127 barrels of flour for $7.50 a barrel, and gained $254. How much did he give per barrel ?

51. Two men start from the same point to go in opposite directions, one 3 miles per hour, the other 4 miles. In how many hours are they 350 miles apart ?

52. Two men are travelling in the same direction, and one of them is 60 miles in advance of the other. He travels 20 miles a day, and the other one, 25 miles a day. In how many days will the latter overtake the former ?

53. How many minutes are there in 2 days ? In 5 days ?

54. Mr. James bought 500 yards of calico at 8 cents a yard, and gave in payment a $50 bill. How much change was coming to him ?

55. If one train travels 25 miles an hour for 100 hours, and another 30 miles an hour for 15 hours, which travels the farther, and how much ?

56. A traveller had $300. After travelling 900 miles at 3 cents a mile, and 500 miles at 5 cents a mile, and spending 43 days in hotels at $2 a day, how much money did he have left ?

57. A farmer sold 1,200 bushels of wheat at $.96 a bushel, 225 barrels of corn at $3 a barrel, 120 bushels of oats at $.43 cents a bushel, and 60 head of cattle at $20 a head. What was the amount of his sales ?

58. What number multiplied by 463 will give, as a product, 12,964 ?

COMMON FRACTIONS.

144. 1. How much money did Jane receive, if she and her two sisters divided 27 cents equally among them ?

2. Thomas had 36 cents, and spent *one-fourth* of his money for marbles. How much did the marbles cost him ?

3. Matthew was *one-fifth* as old as his father. His father was 45 years old. How old was Matthew ?

4. If Mabel receives from her mother 30 cents every week, and saves $\frac{1}{6}$ of it, how much does she save each week ?

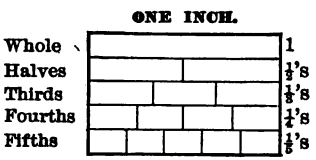
145. Show by the diagram that:

One-half, $\frac{1}{2}$, is *one* of the *two equal* parts of a unit ;
One-third, $\frac{1}{3}$, is *one* of the *three equal* parts of a unit ;
One-fourth, $\frac{1}{4}$, is *one* of the *four equal* parts of a unit ;
One-fifth, $\frac{1}{5}$, is *one* of the *five equal* parts of a unit.

146. Count the number of $\frac{1}{2}$'s, $\frac{1}{3}$'s, $\frac{1}{4}$'s, $\frac{1}{5}$'s, in a unit.

147. Show by the diagram that:

One unit equals :



two-halves, $\frac{2}{2}$, $\frac{\text{two}}{\text{halves}}$.

three-thirds, $\frac{3}{3}$, $\frac{\text{three}}{\text{thirds}}$.

four-fourths, $\frac{4}{4}$, $\frac{\text{four}}{\text{fourths}}$.

five-fifths, $\frac{5}{5}$, $\frac{\text{five}}{\text{fifths}}$.

148. Write from dictation :

1. Two-thirds. *3.* Two-fourths. *5.* Four-fourths. *7.* Three-fifths.
2. Three-thirds. *4.* Three-fourths. *6.* Two-fifths. *8.* Four-fifths.

149. Copy, and explain :

$\frac{1}{2}$	$\frac{2}{2}$		$\frac{1}{4}$	$\frac{2}{4}$	$\frac{3}{4}$	$\frac{4}{4}$		$\frac{1}{6}$	$\frac{2}{6}$	$\frac{3}{6}$	$\frac{4}{6}$	$\frac{5}{6}$	$\frac{6}{6}$
$\frac{1}{3}$	$\frac{2}{3}$	$\frac{3}{3}$	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$	$\frac{5}{5}$	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{3}{7}$	$\frac{4}{7}$	$\frac{5}{7}$	$\frac{6}{7}$ $\frac{7}{7}$

150. A **fraction** is one or more of the *equal parts* of a unit or of a number.

151. A **fractional unit** is *one* of the equal parts into which a unit is divided.

Thus: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, etc., are fractional units.

152. A **common fraction** is expressed by two numbers written one above the other with a line between them.

Thus: $\frac{3}{4}$, $\frac{2}{3}$, $\frac{7}{8}$, $\frac{9}{7}$, $\frac{6}{5}$ are *common fractions.*

153. The number below the line is called the **denominator,** as it *names,* or shows the size of the fractional units.

154. The number above the line is called the **numerator,** as it *numbers,* or tells how many of the equal parts are taken.

155. A whole number is an **integer.**

156. In reading fractions read the numerator first, and then the denominator, ending with th, or ths. Thus: $\frac{3}{4}$, three-fourths; $\frac{5}{6}$, five-sixths; $\frac{3}{8}$, three-eighths; $\frac{12}{25}$, twelve twenty-fifths; $\frac{9}{84}$, nine eighty-fourths.

NOTE.—When the denominator is 1, 2, or 3, read it as so many *ones, halves,* or *thirds;* when the denominator ends in 1, 2, or 3, read it as so many *firsts, seconds,* or *thirds,* the rule above holding only for elevenths, twelfths, and thirteenths. Thus: $\frac{3}{21}$, three twenty-firsts; $\frac{7}{32}$, seven thirty-seconds.

157. Read the following fractions, and indicate the numerators and denominators, explaining the meaning of each:

$\frac{2}{3}$	$\frac{2}{4}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{2}{6}$	$\frac{3}{6}$	$\frac{2}{7}$	$\frac{3}{7}$	$\frac{2}{8}$	$\frac{3}{8}$	$\frac{6}{8}$	$\frac{7}{8}$
$\frac{3}{4}$	$\frac{4}{4}$	$\frac{4}{5}$	$\frac{5}{5}$	$\frac{4}{6}$	$\frac{5}{6}$	$\frac{4}{7}$	$\frac{5}{7}$	$\frac{4}{8}$	$\frac{5}{8}$	$\frac{5}{9}$	$\frac{9}{10}$

Thus: $\frac{2}{3}$, two-thirds, has 3 for its denominator, and 2 for its numerator; the 3 means that the unit has been divided into 3 equal parts; the 2 means that 2 of these parts have been taken to form the fraction.

158. Write from dictation the fractions taken in any order from Art. 157.

ADDITION.

159. To add fractions with the same denominator.

1. Edgar earned 2 dollars in one day, and 3 dollars in another day. How much did he earn in both days?

2. Frank sold papers of one kind for 1 dime and papers of another kind for 2 dimes. What was the amount of his sales?

3. Samuel spent 1 fifth of a dollar for fire-works and John, 3 fifths of a dollar. How much did they both spend?

4. James did $\frac{1}{6}$ of his work on Monday, $\frac{1}{6}$ on Tuesday, and $\frac{1}{6}$ on Wednesday. How much of his work did he do in the three days?

5. Mr. Brown sold $\frac{1}{4}$ of a yard of silk to one lady and $\frac{3}{4}$ of a yard to another lady. How much did he sell in all?

6. Kate gave $\frac{3}{7}$ of her money to her little sister and $\frac{2}{7}$ to a poor little boy. How much of her money did she give away?

7. Frank bought skates for $\frac{7}{10}$ of a dollar and straps for $\frac{3}{10}$ of a dollar. How much money did he spend?

8. After Jennie had spent $\frac{7}{9}$ of her money, she had $\frac{2}{9}$ of it left. How much did she have at first?

160. Find the sums in the following:

1. $\frac{1}{4}+\frac{2}{4}$. *4.* $\frac{1}{6}+\frac{3}{6}+\frac{1}{6}$. *7.* $\frac{4}{9}+\frac{3}{9}+\frac{2}{9}$. *10.* $\frac{3}{12}+\frac{5}{12}+\frac{3}{12}$.

2. $\frac{1}{5}+\frac{3}{5}$. *5.* $\frac{2}{7}+\frac{1}{7}+\frac{3}{7}$. *8.* $\frac{3}{10}+\frac{5}{10}+\frac{1}{10}$. *11.* $\frac{2}{12}+\frac{6}{12}+\frac{4}{12}$.

3. $\frac{2}{5}+\frac{3}{5}$. *6.* $\frac{3}{8}+\frac{2}{8}+\frac{3}{8}$. *9.* $\frac{2}{10}+\frac{4}{10}+\frac{3}{10}$. *12.* $\frac{4}{15}+\frac{3}{15}+\frac{6}{15}$.

161. Copy, and complete the following:

1.	2.	3.	4.	5.	6.
$15\frac{1}{3}$	$27\frac{1}{4}$	$18\frac{3}{5}$	$30\frac{2}{5}$	25	$43\frac{3}{8}$
21	$13\frac{2}{4}$	45	$6\frac{1}{5}$	$8\frac{1}{6}$	$16\frac{2}{8}$
$16\frac{1}{3}$	36	$17\frac{1}{5}$	78	$33\frac{3}{6}$	$17\frac{1}{8}$
$52\frac{2}{3}$	$76\frac{3}{4}$				

162. Reduction. 1. James spent \$$\frac{1}{4}$ on Monday, and \$$\frac{3}{4}$ on Tuesday. How much money did he spend in both days?

2. Charles bought a book for \$$\frac{3}{5}$, and a sailboat for \$$\frac{2}{5}$. How much did he spend?

3. John sawed $\frac{3}{7}$ of a cord of wood on one day, and $\frac{4}{7}$ of it the next day. How much of it did he saw in both days?

4. How many \$$\frac{1}{4}$'s are there in \$1? How many \$$\frac{1}{2}$'s in \$1?

5. How many $\frac{1}{2}$'s are there in a unit? How many $\frac{1}{3}$'s? How many $\frac{1}{4}$'s? How many $\frac{1}{5}$'s? How many $\frac{1}{6}$'s? How many $\frac{1}{7}$'s? How many $\frac{1}{8}$'s? How many $\frac{1}{9}$'s? How many $\frac{1}{10}$'s?

6. How many units are there in $\frac{4}{2}$? In $\frac{6}{3}$? In $\frac{8}{4}$? In $\frac{10}{5}$? In $\frac{12}{6}$?

As $\frac{2}{2}$ equal 1 unit, $\frac{4}{2}$ equal as many units as 2 is contained times in 4. Answer, 2 units.

7. How many units are there in $\frac{6}{2}$? In $\frac{12}{3}$? In $\frac{12}{4}$?

8. How many units are there in $\frac{3}{2}$?

As $\frac{2}{2}$ equal 1 unit, in $\frac{3}{2}$ there are as many units as 2 is contained times in 3, or one unit and $\frac{1}{2}$ more. Answer, $1\frac{1}{2}$ units.

9. How many units are there in $\frac{5}{2}$? In $\frac{7}{2}$? In $\frac{9}{2}$?

10. How many units are there in $\frac{5}{3}$? In $\frac{7}{3}$? In $\frac{8}{3}$?

As $\frac{3}{3}$ equal 1 unit, in $\frac{5}{3}$ there are as many units as 3 is contained times in 5, or 1 unit and $\frac{2}{3}$ more. Answer, $1\frac{2}{3}$ units.

163. Read at sight the number of units:

$\frac{6}{2}$	$\frac{8}{2}$	$\frac{8}{4}$	$\frac{10}{5}$	$\frac{6}{3}$	$\frac{18}{2}$	$\frac{20}{4}$	$\frac{16}{8}$	$\frac{14}{7}$	$\frac{21}{7}$	$\frac{16}{4}$
$\frac{10}{2}$	$\frac{12}{3}$	$\frac{15}{5}$	$\frac{15}{3}$	$\frac{16}{2}$	$\frac{21}{5}$	$\frac{14}{3}$	$\frac{13}{6}$	$\frac{15}{2}$	$\frac{22}{2}$	$\frac{25}{12}$
$\frac{12}{2}$	$\frac{13}{3}$	$\frac{12}{4}$	$\frac{15}{6}$	$\frac{15}{3}$	$\frac{18}{6}$	$\frac{19}{2}$	$\frac{18}{3}$	$\frac{17}{6}$	$\frac{17}{9}$	$\frac{20}{12}$

164. State the reason for the answer in each of the preceding examples.

Thus, for $\frac{6}{2}$: $\frac{2}{2}$ equal 1 unit; $\frac{6}{2}$ equal as many units as 2 is contained times in 6. Answer, 3 units.

165. To reduce a fraction to a whole or mixed number, divide the numerator by the denominator, and write the remainder, if any, over the denominator.

166. A number consisting of a whole number and a fraction is called a **mixed number.**

167. When the numerator of a fraction is less than its denominator the fraction is called a **proper fraction.**

168. When the numerator of a fraction is equal to or greater than its denominator, the fraction is called an **improper fraction.**

Which of the fractions on page 140 are proper fractions, and which are improper fractions?

169. Find the number of units:

1. $\frac{1}{4} + \frac{2}{4} + \frac{1}{4}$.	*4.* $\frac{3}{4} + \frac{2}{4} + \frac{3}{4}$.	*7.* $\frac{5}{8} + \frac{6}{8} + \frac{7}{8}$.
2. $\frac{2}{5} + \frac{1}{5} + \frac{3}{5}$.	*5.* $\frac{2}{5} + \frac{7}{5} + \frac{4}{5}$.	*8.* $\frac{6}{7} + \frac{5}{7} + \frac{3}{7}$.
3. $\frac{3}{6} + \frac{4}{6} + \frac{2}{6}$.	*6.* $\frac{4}{6} + \frac{5}{6} + \frac{3}{6}$.	*9.* $\frac{8}{10} + \frac{5}{10} + \frac{9}{10}$.

170. Oral Problems. 1. Jane spent $\$\frac{7}{8}$ for calico and $\$\frac{2}{8}$ for ribbon. How many dollars did she spend?

$\$\frac{7}{8} + \$\frac{2}{8} = \$\frac{9}{8}$; as $\$\frac{8}{8} = \$1$, in $\$\frac{9}{8}$ there are as many dollars as 8 is contained times in 9, or $1\frac{1}{8}$. Answer, $\$1\frac{1}{8}$.

2. Thomas ran $\frac{5}{7}$ of a mile and walked $\frac{4}{7}$ of a mile. How far did he go?

$\frac{5}{7} + \frac{4}{7} = \frac{9}{7}$, or $\frac{7}{7} + \frac{2}{7}$, or $1 + \frac{2}{7}$. Answer, $1\frac{2}{7}$ miles.

3. Fred bought a pair of shoes for $\$2\frac{1}{4}$, a hat for $\$\frac{3}{4}$, and a pair of gloves for $\$\frac{1}{4}$. How much did he spend?

$$\$2\tfrac{1}{4} + \$\tfrac{3}{4} + \$\tfrac{1}{4} = \$2\tfrac{5}{4} = \$3 + \$\tfrac{1}{4} = \$3\tfrac{1}{4}.$$

4. Mr. Jones sold from a piece of muslin $3\frac{5}{8}$ yds., $\frac{3}{8}$ yds., and $\frac{7}{8}$ yds. How many yards in all did he sell?

5. Henry, James, and John owned $2\frac{7}{8}$, $\frac{5}{8}$, and $\frac{3}{8}$ acres of land. How many acres in all did they own?

6. In 3 sacks there were $2\frac{3}{4}$, $\frac{1}{4}$, and $\frac{3}{4}$ bushels of wheat. How many bushels of wheat were there in the 3 sacks?

7. Mrs. Shaw spent the following sums of money: $\$\frac{9}{10}$, $\$\frac{8}{10}$, $\$\frac{7}{10}$, and $\$\frac{6}{10}$. How much in all did she spend?

8. Charles had $\frac{7}{12}$ of a quire of note paper, and bought $1\frac{5}{12}$ of a quire. How many quires of paper did he then have?

9. Mary finished $\frac{5}{9}$ of her problems before dinner and $\frac{4}{9}$ after dinner. What part of her problems had she then done?

10. If Jane has $2\frac{5}{8}$ yards of gingham and she buys $2\frac{3}{8}$ yards more, how many yards has she then?

11. If Henry earns $\$3\frac{3}{5}$ in one week and $\$2\frac{2}{5}$ the next week, how much does he earn in both weeks?

12. How much will John and James together earn, if John earns $\$5\frac{2}{3}$ and James $\$6\frac{1}{3}$?

13. Edgar spent $\$2\frac{3}{8}$ and then had $\$\frac{5}{8}$ left. How many dollars did he have at first?

14. A barrel contained $1\frac{3}{4}$ bushels of oats and $1\frac{1}{4}$ bushels of corn. How many bushels of grain did the barrel contain?

171. Copy, and complete:

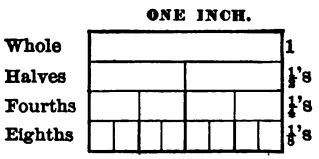
1.	2.	3.	4.	5.
$105\frac{1}{4}$	$47\frac{1}{5}$	$168\frac{1}{3}$	$270\frac{3}{5}$	$85\frac{3}{8}$
$36\frac{3}{4}$	123	$75\frac{2}{3}$	$96\frac{2}{5}$	$17\frac{5}{8}$
48	$68\frac{3}{5}$	$106\frac{2}{3}$	$107\frac{4}{5}$	$221\frac{6}{8}$
$16\frac{1}{4}$	$104\frac{2}{5}$	$15\frac{1}{3}$	$61\frac{3}{5}$	$104\frac{3}{8}$
206	$3\frac{1}{5}$	6	$\frac{2}{5}$	

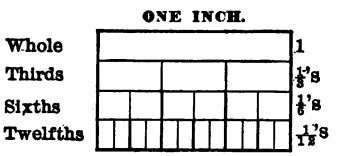
6.	7.	8.	9.	10.
$381\frac{4}{5}$	$132\frac{4}{6}$	$260\frac{4}{7}$	$59\frac{9}{10}$	409
$47\frac{3}{5}$	$79\frac{5}{6}$	$105\frac{6}{7}$	263	$777\frac{7}{9}$
$62\frac{4}{5}$	$203\frac{5}{6}$	89	$78\frac{6}{10}$	$160\frac{8}{9}$
$127\frac{3}{5}$	$78\frac{4}{6}$	$283\frac{5}{7}$	$306\frac{9}{10}$	$487\frac{7}{9}$

172. To add fractions with different denominators.

1. How many are 5 horses and 6 cows?
2. How many are 5 animals and 6 animals?
3. How many are 2 sparrows and 3 robins? Five what?
4. How many are 2 birds and 3 birds?
5. With what common name can 2 salmon, 3 herrings, and 4 mackerel be added?
6. With what common name can 3 elms, 4 willows, and 5 oaks be added?
7. How can halves, fourths, and eighths be added?
8. How can halves, thirds, and sixths be added?
9. How can halves, thirds, and fourths be added?
10. How can thirds, fourths, and fifths be added?
11. How can any fractions be added?

173. Fractions can be added only when they have a common name, that is, a **common denominator.**





174. Show by the diagrams that:

$1 = \frac{2}{2} = \frac{4}{4} = \frac{8}{8}.$
$\frac{1}{2} = \frac{2}{4} = \frac{4}{8}.$
$\frac{1}{4} = \frac{2}{8}.\quad \frac{3}{4} = \frac{6}{8}.$

$1 = \frac{3}{3} = \frac{6}{6} = \frac{12}{12}.$
$\frac{1}{3} = \frac{2}{6} = \frac{4}{12}.\quad \frac{2}{3} = \frac{4}{6} = \frac{8}{12}.$
$\frac{1}{6} = \frac{2}{12}.\quad \frac{3}{6} = \frac{6}{12}.\quad \frac{5}{6} = \frac{10}{12}.$

175. Show by the diagrams that:

$\frac{1}{2} + \frac{1}{4} = \frac{3}{4}.$
$\frac{1}{2} + \frac{2}{4} = 1.$
$\frac{1}{3} + \frac{1}{6} = \frac{3}{6}.$
$\frac{1}{3} + \frac{2}{6} = \frac{4}{6}.$

$\frac{1}{4} + \frac{1}{8} = \frac{3}{8}.$
$\frac{1}{4} + \frac{3}{8} = \frac{5}{8}.$
$\frac{1}{6} + \frac{1}{12} = \frac{3}{12}.$
$\frac{1}{6} + \frac{3}{12} = \frac{5}{12}.$

$\frac{3}{4} + \frac{1}{8} = \frac{7}{8}.$
$\frac{3}{4} + \frac{3}{8} = 1\frac{1}{8}.$
$\frac{3}{6} + \frac{1}{12} = \frac{7}{12}.$
$\frac{3}{6} + \frac{3}{12} = \frac{9}{12}.$

$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \frac{7}{8}.$
$\frac{1}{2} + \frac{3}{4} + \frac{5}{8} = 1\frac{7}{8}.$
$\frac{1}{3} + \frac{1}{6} + \frac{1}{12} = \frac{7}{12}.$
$\frac{1}{3} + \frac{3}{6} + \frac{5}{12} = 1\frac{3}{12}.$

176. State the reason for the answers in each of the following:

$\frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{8}{16}$, etc.	$\frac{1}{2} = \frac{3}{6} = \frac{9}{18}$, etc.	$\frac{1}{2} = \frac{4}{8} = \frac{16}{32}$, etc.
$\frac{1}{3} = \frac{2}{6} = \frac{4}{12} = \frac{8}{24}$, etc.	$\frac{1}{3} = \frac{3}{9} = \frac{9}{27}$, etc.	$\frac{1}{3} = \frac{4}{12} = \frac{16}{48}$, etc.
$\frac{1}{4} = \frac{2}{8} = \frac{4}{16} = \frac{8}{32}$, etc.	$\frac{1}{4} = \frac{3}{12} = \frac{9}{36}$, etc.	$\frac{1}{4} = \frac{4}{16} = \frac{16}{64}$, etc.
$\frac{1}{5} = \frac{2}{10} = \frac{4}{20} = \frac{8}{40}$, etc.	$\frac{1}{5} = \frac{3}{15} = \frac{9}{45}$, etc.	$\frac{1}{5} = \frac{4}{20} = \frac{16}{80}$, etc.

Thus: $\frac{4}{12} = \frac{8}{24} : 1 = \frac{24}{24}$; then $\frac{1}{12} = \frac{2}{24}$ and $\frac{4}{12} = \frac{8}{24}$.
$\frac{3}{9} = \frac{9}{27} : 1 = \frac{27}{27}$; then $\frac{1}{9} = \frac{3}{27}$ and $\frac{3}{9} = \frac{9}{27}$.

NOTE.—In the preceding series of fractions observe the effect of multiplying or of dividing both numerator and denominator by the same number.

177. Principle. Multiplying or dividing both numerator and denominator of a fraction by the same number does not change the value of the fraction.

The numerator numbers the equal parts taken to form the fraction, and if it is multiplied or divided, so is also the fraction; while the opposite effect is produced by multiplying or dividing the denominator, as may be seen by studying the diagrams on page 143.

178. By the preceding principle explain the following series of fractions:

$\frac{16}{24} = \frac{8}{12} = \frac{4}{6} = \frac{2}{3}$	$\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12} = \frac{10}{15}$
$\frac{24}{32} = \frac{12}{16} = \frac{6}{8} = \frac{3}{4}$	$\frac{3}{4} = \frac{6}{8} = \frac{9}{12} = \frac{12}{16} = \frac{15}{20}$
$\frac{20}{50} = \frac{10}{25} = \frac{4}{10} = \frac{2}{5}$	$\frac{2}{5} = \frac{4}{10} = \frac{6}{15} = \frac{8}{20} = \frac{10}{25}$
$\frac{24}{40} = \frac{12}{20} = \frac{6}{10} = \frac{3}{5}$	$\frac{3}{5} = \frac{6}{10} = \frac{9}{15} = \frac{12}{20} = \frac{15}{25}$
$\frac{32}{40} = \frac{16}{20} = \frac{8}{10} = \frac{4}{5}$	$\frac{4}{5} = \frac{8}{10} = \frac{12}{15} = \frac{16}{20} = \frac{20}{25}$
Thus: $\frac{12}{16} = \frac{6}{8}$: dividing both numerator and denominator of $\frac{12}{16}$ by 2 gives $\frac{6}{8}$.	Thus: $\frac{2}{3} = \frac{8}{12}$: multiplying both numerator and denominator of $\frac{2}{3}$ by 3 gives $\frac{6}{9}$; and by 4 gives $\frac{8}{12}$.

179. A fraction may be reduced to its lowest terms by dividing both numerator and denominator by their greatest common divisor.

180. Since to add fractions they must have a common denominator, if the fractions are to be changed they should be changed to fractions whose denominators are the least common multiples of the given denominators.

181. Find the sums in their lowest terms and explain:

$\frac{1}{2} + \frac{3}{4} + \frac{5}{8} = \frac{15}{8} = 1\frac{7}{8}$. $\frac{1}{2} + \frac{1}{3} + \frac{3}{6} = \; = .$ $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \; = .$

$\frac{1}{2} + \frac{2}{4} + \frac{6}{8} = \; = .$ $\frac{1}{2} + \frac{2}{3} + \frac{5}{6} = \; = .$ $\frac{1}{2} + \frac{2}{3} + \frac{1}{4} = \; = .$

$\frac{3}{2} + \frac{1}{4} + \frac{7}{8} = \; = .$ $\frac{1}{2} + \frac{4}{3} + \frac{1}{6} = \; = .$ $\frac{1}{2} + \frac{2}{3} + \frac{3}{4} = \; = .$

$\frac{1}{2} + \frac{3}{4} + \frac{6}{8} = \; = .$ $\frac{3}{2} + \frac{2}{3} + \frac{7}{6} = \; = .$ $\frac{5}{2} + \frac{4}{3} + \frac{3}{4} = \; = .$

Thus: the least common multiple of the denominators 2, 4, and 8 is 8;

$$\tfrac{1}{2} = \tfrac{4}{8}\,;\ \tfrac{3}{4} = \tfrac{6}{8}\,;\ \text{then } \tfrac{4}{8} + \tfrac{6}{8} + \tfrac{5}{8} = \tfrac{15}{8} = 1\tfrac{7}{8}.$$

182. Find in their lowest terms the sums in Article 175.

183. Copy, and complete:

1.	2.	3.	4.	5.
1	2	2		
$\$25\frac{2}{3}$..8	$\$13\frac{1}{2}$..3	$\$45\frac{3}{4}$..	$\$86\frac{5}{6}$...	$\$75\frac{3}{4}$
$18\frac{1}{4}$..3 | 12	$50\frac{2}{3}$..4 | 6	$9\frac{1}{2}$..	$42\frac{3}{4}$...	$36\frac{3}{8}$
$7\frac{1}{2}$..6	$11\frac{5}{6}$..5	$36\frac{7}{8}$..	$5\frac{5}{12}$..	$27\frac{1}{2}$
$\$51\frac{5}{12}$. Ans.	$\$76$. Ans.	$\$$		

6.	7.	8.	9.	10.
$\$100\frac{1}{5}$	$\$ 73$	$\$204\frac{5}{6}$	$\$ 41\frac{2}{3}$	$\$570\frac{4}{5}$
$58\frac{3}{4}$	$236\frac{7}{8}$	$58\frac{1}{4}$	162	96
276	$29\frac{5}{6}$	182	$77\frac{4}{5}$	$238\frac{3}{4}$
$37\frac{1}{2}$	$162\frac{1}{4}$	$60\frac{11}{12}$	$304\frac{1}{3}$	$407\frac{5}{6}$

184. Written Problems. 1. How much calico is there in four pieces containing $24\frac{2}{3}$, $18\frac{3}{4}$, $19\frac{1}{2}$, and $20\frac{1}{4}$ yards?

2. Mr. Jenkins spent in three weeks $\$15\frac{3}{4}$, $\$16\frac{7}{8}$, and $\$12\frac{1}{2}$. How much did he spend in the three weeks together?

3. Mr. Shaw in four months earned $\$40\frac{1}{2}$, $\$38\frac{4}{5}$, $\$42\frac{9}{10}$, $\$41\frac{3}{5}$. How much altogether did he earn?

4. Charles deposited in a savings-bank $\$12\frac{1}{2}$, $\$20\frac{3}{4}$, and $\$18\frac{4}{5}$. How much in all did he deposit?

5. A grocer sold sugar for $\$2\frac{3}{8}$, tea for $\$1\frac{3}{4}$, and coffee for $\$1\frac{1}{2}$. How much should he receive for all?

6. What is the amount of the following bills: $\$10\frac{7}{8}$, $\$5\frac{3}{4}$, $\$9\frac{1}{4}$, $\$12\frac{1}{2}$, and $\$11\frac{5}{8}$?

7. Mrs. Moore spent the following number of years in Florida: $2\frac{1}{2}$, $1\frac{5}{12}$, $3\frac{3}{4}$, and $2\frac{5}{8}$ years. How many years did Mrs. Moore spend in Florida?

8. Sophie spent in shopping the following sums: $\$4\frac{9}{10}$, $\$3\frac{3}{5}$, $\$5\frac{1}{2}$, $\$6\frac{4}{5}$, and $\$7\frac{7}{10}$. How much in all did she spend?

9. Frank walked the following number of miles: $18\frac{3}{4}$, $20\frac{1}{2}$, $16\frac{7}{8}$. To complete his journey he must travel $25\frac{5}{8}$ miles farther. How long was the journey?

10. If Martha buys a dress for $\$6\frac{3}{8}$, a bonnet for $\$4\frac{9}{10}$, and has $\$12\frac{3}{4}$ left, how much did she have at first?

11. After subtracting $37\frac{5}{6}$, $20\frac{11}{12}$, $13\frac{3}{4}$, and $27\frac{7}{8}$ from a number, $10\frac{7}{12}$ remained. What was the number?

SUBTRACTION.

185. To subtract when the fraction in the subtrahend is less than the fraction in the minuend.

1. Jacob walked $\frac{3}{4}$ of a mile, and Frank $\frac{5}{8}$ of a mile. Which walked the greater distance, and how much?

$\frac{3}{4} = \frac{6}{8}$; $\frac{6}{8} - \frac{5}{8} = \frac{1}{8}$. Answer: James, $\frac{1}{8}$.

2. Martha had $\$1\frac{3}{4}$ and she spent $\$\frac{1}{2}$. How much money did she have left?

$\frac{1}{2} = \frac{2}{4}$; $1\frac{3}{4} - \frac{2}{4} = 1\frac{1}{4}$. Answer, $\$1\frac{1}{4}$.

3. Which is the more expensive, and how much; chintz at $\$\frac{1}{6}$ a yard, or French calico at $\$\frac{1}{4}$ a yard?

4. What is the difference in price between crushed sugar at $\$\frac{1}{10}$ per lb. and powdered sugar at $\$\frac{1}{12}$ per pound ?

5. Mr. Jacobs bought hats for $\$2\frac{1}{3}$ each and sold them for $\$2\frac{7}{8}$ each. Did he gain or lose, and how much ?

6. If Thomas earns $\$6\frac{3}{4}$ per week and spends $\$5\frac{2}{3}$, how much has he left ?

$$\$6\tfrac{3}{4} = \$6\tfrac{9}{12}\ ;\ \$5\tfrac{2}{3} = \$5\tfrac{8}{12}\ ;\ \$6\tfrac{9}{12} - \$5\tfrac{8}{12} = \$1\tfrac{1}{12}.\quad \text{Answer.}$$

7. How much more does a coat cost at $\$8\frac{4}{5}$ than at $\$6\frac{1}{2}$?

8. James had $\$5\frac{3}{4}$ less $\$2\frac{3}{8}$. How much money had he ?

186. Find the differences:

1. $\frac{2}{3} - \frac{1}{2}$.	*4.* $1\frac{1}{2} - \frac{1}{4}$.	*7.* $5\frac{5}{8} - 1\frac{1}{4}$.	*10.* $10\frac{1}{2} - 8\frac{1}{3}$.
2. $\frac{3}{4} - \frac{2}{3}$.	*5.* $2\frac{3}{4} - \frac{1}{2}$.	*8.* $3\frac{5}{6} - 2\frac{1}{3}$.	*11.* $7\frac{3}{5} - 6\frac{1}{2}$.
3. $\frac{7}{8} - \frac{3}{4}$.	*6.* $4\frac{1}{3} - \frac{1}{4}$.	*9.* $7\frac{4}{5} - 3\frac{1}{2}$.	*12.* $25\frac{1}{6} - 20\frac{1}{8}$.

187. Copy, and complete:

1.	2.	3.	4.	5.
$\$20\frac{4}{5}$..8 | 10	$\$16\frac{2}{3}$..16 | 24	$\$50\frac{2}{3}$	$\$72\frac{5}{6}$	$\$100\frac{3}{4}$
$13\frac{1}{2}$..5	$15\frac{3}{8}$.. 9	$25\frac{3}{5}$	$43\frac{3}{4}$	$59\frac{5}{8}$
$\$7\frac{3}{10}$	$\$1\frac{7}{24}$			

6.	7.	8.	9.	10.	11.
$\$209\frac{3}{4}$	$\$75\frac{11}{12}$	$\$64\frac{2}{3}$	$\$323\frac{1}{2}$	$\$83\frac{4}{5}$	$\$134\frac{7}{9}$
$159\frac{2}{8}$	$15\frac{1}{2}$	$24\frac{5}{8}$	$103\frac{2}{7}$	$14\frac{2}{3}$	$27\frac{1}{6}$

188. To subtract when the fraction in the subtrahend is greater than the fraction in the minuend.

1. Mary had $\$1$ and she spent $\$\frac{3}{8}$. How much did she then have ?

$$\$1 = \$\tfrac{8}{8}\ ;\ \$\tfrac{8}{8} - \$\tfrac{3}{8} = \$\tfrac{5}{8}.$$

2. Charles had only $\$\frac{1}{2}$, but wished to buy a pair of skates for $\$\frac{3}{5}$. How much more money did he need ?

$$\$\tfrac{3}{5} = \$\tfrac{6}{10}\ ;\ \$\tfrac{1}{2} = \$\tfrac{5}{10};\ \$\tfrac{6}{10} - \$\tfrac{5}{10} = \$\tfrac{1}{10}.$$

3. Mrs. Brown had a piece of calico containing 5 yards. How much did she have in the piece after cutting off $\frac{2}{3}$ of a yard?

$$5 = 4 + 1;\ 1 = \tfrac{3}{3};\ 5 = 4 + \tfrac{3}{3};\ 4\tfrac{3}{3} - \tfrac{2}{3} = 4\tfrac{1}{3}.$$

4. Mr. Carr bought sugar for 5 ¢ a pound and sold it at a loss of $\frac{3}{8}$ ¢ a pound. What was his selling price?

$$5 = 4 + 1;\ 1 = \tfrac{8}{8};\ 5 = 4\tfrac{8}{8};\ 4\tfrac{8}{8} - \tfrac{3}{8} = 4\tfrac{5}{8}.$$

5. Mrs. Baker cut $\frac{3}{4}$ of a yard from a piece of silk containing $10\frac{1}{8}$ yards. How many yards were left in the piece?

$$10\tfrac{1}{8} = 9 + 1\tfrac{1}{8} = 9\tfrac{9}{8};\ \tfrac{3}{4} = \tfrac{6}{8};\ 9\tfrac{9}{8} - \tfrac{6}{8} = 9\tfrac{3}{8}.$$

6. Frank gathered $4\frac{3}{8}$ bushels of apples in the morning, and $\frac{1}{2}$ bushel less in the afternoon. How many bushels did he gather in the afternoon?

$$4\tfrac{3}{8} = 3\tfrac{11}{8};\ \tfrac{1}{2} = \tfrac{4}{8};\ 3\tfrac{11}{8} - \tfrac{4}{8} = 3\tfrac{7}{8}.$$

7. Richard was $20\frac{1}{3}$ years old; his little brother was $2\frac{5}{6}$ years old. The brother was how much younger than Richard?

$$20\tfrac{1}{3} = 20\tfrac{2}{6} = 19\tfrac{8}{6};\ 19\tfrac{8}{6} - 2\tfrac{5}{6} = 17\tfrac{3}{6} = 17\tfrac{1}{2}.$$

189. Read at sight the number of:

$\frac{1}{2}$'s	in	1	2	3	4	5	$1\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{2}$	$5\frac{1}{2}$
$\frac{1}{3}$'s	"	1	2	3	4	5	$1\frac{1}{3}$	$1\frac{2}{3}$	$2\frac{1}{3}$	$2\frac{2}{3}$	$3\frac{1}{3}$
$\frac{1}{4}$'s	"	1	2	3	4	5	$1\frac{1}{4}$	$1\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{3}{4}$	$3\frac{1}{4}$
$\frac{1}{5}$'s	"	1	2	3	4	5	$1\frac{1}{5}$	$1\frac{2}{5}$	$1\frac{3}{5}$	$1\frac{4}{5}$	$2\frac{1}{5}$
$\frac{1}{6}$'s	"	1	2	3	4	5	$1\frac{1}{6}$	$1\frac{5}{6}$	$2\frac{1}{6}$	$2\frac{5}{6}$	$3\frac{1}{6}$
$\frac{1}{7}$'s	"	1	2	3	4	5	$1\frac{1}{7}$	$1\frac{3}{7}$	$2\frac{1}{7}$	$2\frac{6}{7}$	$3\frac{5}{7}$

190. State the reason for the answer in each of the preceding examples:

Thus: $\frac{1}{3}$'s in $2\frac{2}{3}$: In 1 unit there are $\frac{3}{3}$; in 2 units, 2 times $\frac{3}{3}$, or $\frac{6}{3}$, which with the $\frac{2}{3}$ make $\frac{8}{3}$.

191. A mixed number may be changed to an improper fraction with any given denominator by first changing the whole number and then adding the fractional part of the mixed number. Thus, $2\frac{2}{3} = \frac{6}{3} + \frac{2}{3} = \frac{8}{3}$.

192. Copy, and complete:

1.	2.	3.	4.	5.
4	1	4	19	29
$\$15\frac{1}{8}$..9 | 8	$\$32\frac{1}{5}$..12 | 10	$\$45\frac{2}{3}$..20 | 12	$\$20\frac{1}{6}$..24 | 20	$\$30\frac{1}{3}$..
$7\frac{3}{4}$..6	$16\frac{1}{2}$.. 5	$27\frac{3}{4}$.. 9	$12\frac{3}{4}$..15	$19\frac{3}{5}$..
$\$7\frac{3}{8}$	$\$15\frac{7}{10}$	$\$17\frac{11}{12}$	$\$7\frac{9}{20}$	$\$$

6.	7.	8.	9.	10.	11.
$\$37\frac{1}{3}$	$\$50\frac{1}{2}$	$\$46\frac{1}{2}$	$\$30\frac{2}{5}$	$\$97\frac{2}{3}$	$\$100\frac{1}{4}$
$15\frac{1}{2}$	$25\frac{5}{8}$	$26\frac{4}{5}$	$29\frac{3}{4}$	$17\frac{4}{5}$	$98\frac{4}{5}$

Ex. 1 : $\frac{3}{4}$ cannot be taken from $\frac{1}{8}$; 1 unit is taken from the 15 units, leaving 14 units ; it is changed to $\frac{1}{8}$'s, making $\frac{8}{8}$'s, which with the $\frac{1}{8}$ makes $\frac{9}{8}$; $\frac{3}{4}$ or $\frac{6}{8}$ from $\frac{9}{8}$ leaves $\frac{3}{8}$, and 7 from 14, 7. Answer, $\$7\frac{3}{8}$.

193. What is the value of:

1. $\frac{1}{2} + \frac{3}{4} - \frac{5}{8}$?
2. $\frac{3}{4} + \frac{1}{8} - \frac{1}{2}$?
3. $\frac{5}{6} - \frac{1}{2} + \frac{2}{3}$?
4. $\frac{2}{3} - \frac{1}{2} + \frac{5}{6}$?
5. $\frac{4}{7} - \frac{1}{2} + \frac{3}{7}$?
6. $\frac{8}{9} + \frac{1}{3} - \frac{2}{3}$?
7. $1\frac{1}{4} + \frac{7}{8} - \frac{1}{2}$?
8. $2\frac{1}{2} - \frac{1}{2} + \frac{3}{4}$?
9. $3\frac{1}{8} - \frac{3}{4} + \frac{1}{2}$?

194. Oral Problems. 1. If a grocer buys 2 tons of coal and sells $\frac{4}{5}$ of a ton, how much coal has he left ?

2. From a jar containing $\frac{7}{8}$ of a gallon of molasses, $\frac{3}{4}$ of a gallon were drawn. How much was left in the jar ?

3. If Mary buys a book for $\$\frac{3}{5}$ and gives in payment a $5 bill, how much change should she receive ?

4. John earned $\$\frac{9}{10}$ and spent $\$\frac{3}{5}$ in a day. How much money had he left ?

5. How much must be added to $8\frac{1}{3}$ to make 10 ?

6. How many acres of land will be left in a farm of 25 acres after selling $1\frac{7}{8}$ acres ?

7. James worked $5\frac{5}{6}$ hours and then found that it was 11 o'clock. At what hour did he begin to work ?

8. A box contained $2\frac{1}{2}$ pounds of candy. How many pounds were left after $\frac{3}{4}$ of a pound of the candy had been eaten ?

9. Mary had a piece of ribbon $5\frac{1}{2}$ yards long. How much did she have left in the piece after cutting off $\frac{7}{8}$ of a yard ?

10. If Henry owns $\frac{3}{5}$ of a boat and sells $\frac{1}{4}$ of the boat, how much will he still own ?

11. If calico is bought for $4\frac{3}{4}$ cents and sold for 6 cents a yard, how much money is made on each yard ?

195. Written Problems. 1. If Mr. Thomas gives 3 dollar-bills and 3 half-dollars for a hat that cost him $\$4\frac{1}{4}$, how much change should he receive ?

2. Frank bought a velocipede for $\$6\frac{1}{4}$ and gave in payment two \$5 bills. What change should the merchant give him ?

3. Mr. Johnson had \$20 and bought a coat for $\$10\frac{3}{8}$. How much money did he have left ?

4. A gold chain at $\$45\frac{1}{2}$ costs how much more than a ring at $\$22\frac{4}{5}$?

5. Arthur has $\$39\frac{9}{10}$ in bank ; John has five \$10 bills. John has how much more money than Arthur ?

6. If $40\frac{7}{8}$ yards are cut from a coil of rope $50\frac{1}{2}$ yards long, how many yards of rope will be left in the coil ?

7. A farmer had a farm containing $45\frac{2}{3}$ acres. He sold $26\frac{4}{5}$ acres. How many acres did he then have ?

8. A merchant bought clocks for $\$17\frac{1}{3}$ and sold them for $\$22\frac{1}{2}$. How much did he make on each clock ?

9. If a gold ring is bought for $\$24\frac{3}{8}$ and sold for $\$19\frac{3}{4}$, how much is lost by the sale ?

MISCELLANEOUS PROBLEMS.

196. Written Problems. 1. If Mr. Brown goes $\frac{1}{4}$ of a distance on horseback, $\frac{2}{3}$ of it on foot, and the rest in a carriage, what part of the distance does he travel in the carriage?

2. John had \$$\frac{5}{8}$ and his father gave him \$$3\frac{1}{4}$. How much did he have left after spending \$$2\frac{4}{5}$?

3. Adele bought two remnants of calico, containing $2\frac{2}{3}$ and $5\frac{3}{4}$ yards. How many more yards does she require to make 10 yards?

4. If Mr. Jarvis pays \$$45\frac{1}{2}$ for a gold chain, and for a ring \$$22\frac{4}{5}$, how much more than both did his watch at \$100 cost him?

5. How much money will be left in a bank account of \$250, after paying three checks for \$$75\frac{2}{3}$, \$$38\frac{1}{4}$, and \$$100\frac{5}{6}$?

6. Mrs. Banks had four \$10 bills and a \$5 bill. How much money did she have left after paying \$$7\frac{3}{8}$ for a parasol, \$$3\frac{1}{2}$ for a fan, \$$4\frac{5}{8}$ for a dozen handkerchiefs, and \$$15\frac{3}{4}$ for a bonnet?

7. A grocer had two barrels of vinegar containing $25\frac{1}{2}$ gallons and $30\frac{1}{4}$ gallons. How many gallons were left after selling $18\frac{3}{4}$ gallons, $2\frac{1}{2}$ gallons, and $10\frac{1}{4}$ gallons?

8. If a merchant buys 3 hats at \$5 each, and sells them for \$$12\frac{7}{8}$, how much does he lose?

9. How many pounds of flour have been used in a month, if at the beginning the barrel contained 196 pounds, and at the end $48\frac{11}{16}$ pounds?

10. Mrs. Barrow owed her grocer for two months \$$38\frac{3}{4}$ and \$$35\frac{4}{5}$. How much did she owe him, after paying \$42.50 on account?

11. Thomas received \$$17\frac{9}{10}$ and \$$15\frac{1}{4}$ as his earnings for two weeks. How much did he have left after spending \$$12\frac{1}{2}$ and \$15.25?

MULTIPLICATION.

197. To multiply a fraction by an integer.

1. Mrs. Hart bought 5 pounds of tea at $\$\frac{3}{4}$ a pound. How much did the 5 pounds cost her?

$$5 \times \$\tfrac{3}{4} = \$\tfrac{15}{4}\ ;\ \$\tfrac{15}{4} = \$3\tfrac{3}{4}.$$

2. A family used $\frac{4}{5}$ of a barrel of flour in one month. How much would the family use at the same rate in six months?

$$6 \times \tfrac{4}{5} = \tfrac{24}{5}\ ;\ \tfrac{24}{5} = 4\tfrac{4}{5}.$$

3. Fred earned $\$\frac{2}{3}$ in one day, and John earned 7 times as much. How many dollars did John earn?

4. How much will 9 yards of muslin cost at $\$\frac{3}{8}$ a yard?

5. How many yards of ribbon will be required to make a dozen ties, if $\frac{5}{6}$ of a yard is required for each tie?

198. Find the cost of the following:

Groceries.				Notions.			
	lb. $		pks. $		yds. $		doz. ¢
1.	4 @ $\frac{3}{8}$.	*5.*	3 @ $\frac{5}{9}$.	*9.*	15 @ $\frac{1}{3}$.	*13.*	1 @ $\frac{1}{3}$ ea.
2.	6 @ $\frac{2}{3}$.	*6.*	5 @ $\frac{9}{10}$.	*10.*	18 @ $\frac{3}{8}$.	*14.*	2 @ $\frac{1}{4}$ ea.
3.	8 @ $\frac{3}{4}$.	*7.*	6 @ $\frac{1}{2}$.	*11.*	20 @ $\frac{4}{5}$.	*15.*	1 @ $\frac{3}{8}$ ea.
4.	9 @ $\frac{5}{6}$.	*8.*	4 @ $\frac{7}{8}$.	*12.*	25 @ $\frac{9}{10}$.	*16.*	4 @ $\frac{5}{6}$ ea.

199. To divide both numerator and denominator of a fraction by the same number is to **cancel** that number as a factor.

200. Cancelling reduces the fractions to the simplest or lowest terms and lessens the labor in solving problems. To cancel simply indicate the work and then divide both numerator and denominator by their greatest common divisor, or by different divisors in succession. The problems in Art. 198 may be worked by cancellation, thus:

Ex. 1: $4 \times \frac{3}{8} = \frac{4 \times 3}{8}$; dividing both numerator and denominator by 4 gives $\frac{\overset{1}{\cancel{4}} \times 3}{\underset{2}{\cancel{8}}} = \frac{3}{2}$ or $1\frac{1}{2}$. Answer, $1\frac{1}{2}$.

201. To multiply a fraction by an integer, either multiply the numerator or, if possible, divide the denominator by the integer, and then reduce the fraction to a whole or mixed number.

202. To find a required part of an integer, or to multiply an integer by a fraction.

1. Earl was $\frac{4}{5}$ as old as his brother Joseph. His brother was 10 years old. How old was Earl?

$$\tfrac{1}{5} \text{ of } 10 = 2\,;\ \tfrac{4}{5} \text{ of } 10 = 8.$$

2. Matthew's age was $\frac{4}{5}$ times that of his brother Fred. His brother's age was 10 years. What was Matthew's age?

$$1 \times 10 = 10\,;\ \tfrac{1}{5} \times 10 = 2\,;\ \tfrac{4}{5} \times 10 = 8.$$

The result is the same, whether $\frac{4}{5}$ of a number be taken, or $\frac{4}{5}$ *times* that number. The part of a number and the corresponding number of times a number are the same.

3. Mrs. Mapes bought $\frac{7}{8}$ of a yard of ribbon at 12 cents a yard. How much did she have to pay for the ribbon?

4. Jesse earned $\frac{5}{6}$ as much as Edgar. If Edgar earned $18, how much did Jesse earn?

5. Mabel's doll cost $\frac{7}{8}$ times as much as Ethel's doll, which cost $1.60. What was the cost of Mabel's doll?

6. What is $\frac{5}{8}$ of a yard of lace worth at 10 cents a yard?

7. Kate had $2.40 in her bank. How much did Josie have, if she had $\frac{2}{3}$ as much as Kate?

8. Thomas had a pony that cost $\frac{3}{4}$ times as much as his brother John's pony. If John's pony cost $160, how much did Thomas's pony cost?

9. Jane lost $\frac{2}{3}$ of a dozen buttons that cost 20 cents a dozen. What was the amount of her loss?

10. If Harry works $\frac{5}{8}$ of a day at $.80 a day, how much does he earn?

203. Find the value of the following:

Without Cancellation.		With Cancellation.	
1. $\frac{3}{4}$ of 7.	*7.* $\frac{2}{3} \times 4$.	*13.* $\frac{4}{5}$ of 25.	*19.* $\frac{5}{8} \times 16$.
2. $\frac{2}{3}$ of 10.	*8.* $\frac{3}{8} \times 7$.	*14.* $\frac{2}{3}$ of 18.	*20.* $\frac{3}{8} \times 40$.
3. $\frac{4}{5}$ of 12.	*9.* $\frac{5}{8} \times 5$.	*15.* $\frac{5}{6}$ of 48.	*21.* $\frac{2}{3} \times 24$.
4. $\frac{3}{8}$ of 5.	*10.* $\frac{4}{5} \times 6$.	*16.* $\frac{7}{8}$ of 32.	*22.* $\frac{5}{6} \times 12$.
5. $\frac{5}{6}$ of 10.	*11.* $\frac{3}{5} \times 8$.	*17.* $\frac{3}{4}$ of 44.	*23.* $\frac{9}{10} \times 90$.
6. $\frac{9}{10}$ of 5.	*12.* $\frac{9}{10} \times 3$.	*18.* $\frac{5}{7}$ of 49.	*24.* $\frac{7}{9} \times 18$.

Ex. 1 : $\frac{3}{4}$ of 7 : $\frac{1}{4}$ of $7 = 1\frac{3}{4}$; $\frac{3}{4}$ of $7 = 5\frac{1}{4}$; or $3 \times 7 = 21$; $\frac{1}{4}$ of $21 = 5\frac{1}{4}$.

204. Find the products:

	1.	**2.**	**3.**	**4.**	**5.**
$\frac{2}{3} \times$	\$165	\$276	\$504	\$105	\$759
	6.	**7.**	**8.**	**9.**	**10.**
$\frac{3}{4} \times$	\$4.05	\$3.15	\$2.07	\$124	\$365
	11.	**12.**	**13.**	**14.**	**15.**
$\frac{4}{5} \times$	\$205	\$325	\$5.50	\$6.75	\$7.32
	16.	**17.**	**18.**	**19.**	**20.**
$\frac{5}{8} \times$	\$1.40	\$2.32	\$3.75	\$509	\$798

205. To multiply an integer by a fraction, or to find a required part of an integer, divide the integer by the denominator and multiply the result by the numerator.

	1.	**6.**
	3)\$165	\$4.05
$\frac{1}{3} =$	\$55	3
	2	4)12.15
$\frac{2}{3} =$	\$110	\$3.03$\frac{3}{4}$

NOTE.—The integer may be multiplied by the numerator, and the result divided by the denominator, as the order of the operations has no effect on the result.

206. When the integer is not large the work is indicated first and then reduced by cancellation.

207. Written Problems. 1. Mr. Johnson's house cost him \$4,200. Mr. Baker's house cost $\frac{6}{7}$ as much. How much did Mr. Baker's house cost?

2. What will $\frac{5}{8}$ of a ship cost, if the entire ship costs \$560,000?

3. If broadcloth sells for \$6.60 a yard, and costs only $\frac{9}{10}$ as much, how much does it cost per yard?

4. Martha bought $\frac{5}{6}$ of a dozen buttons at \$1.86 a dozen. How much did they cost her?

5. If Mr. Samuels pays \$800 a year for rent, how much does he pay for 5 months?

6. What will $\frac{5}{8}$ of a bushel of peaches sell for at \$1.50 a bu.?

7. A man owing \$1,000 paid $\frac{7}{8}$ of his debt. How much money did he pay?

8. Mrs. Purdy paid \$18.40 for groceries and $\frac{3}{4}$ as much for meat in one month. How much did she pay for meat?

9. A ship was sold for \$1,000,000. Mr. Barker owned $\frac{3}{8}$ of it. How much money did he receive?

10. A merchant failed and paid \$$\frac{2}{3}$ on every dollar. B was a creditor for \$6,090. How much did he receive?

208. To find a required part of a fraction, or to multiply a fraction by a fraction.

1. Charles earned \$$\frac{3}{5}$ in one day. How much should he receive for $\frac{2}{3}$ of a day's work?

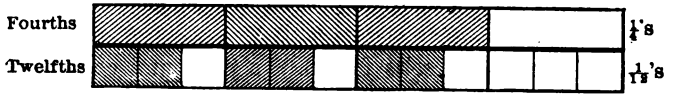
In $\frac{1}{3}$ of a day he would earn $\frac{1}{3}$ of \$$\frac{3}{5}$ or \$$\frac{1}{5}$; in $\frac{2}{3}$ of a day, he would earn 2 times $\frac{1}{5}$, or \$$\frac{2}{5}$. $\frac{2}{3}$ times \$$\frac{3}{5}$ = \$$\frac{2}{5}$.

2. Charles earned \$$\frac{3}{5}$ in one day; his brother James $\frac{2}{3}$ as much. What did James earn in a day?

$$2 \times \tfrac{3}{5} = \tfrac{6}{5}\text{; } \tfrac{1}{3} \text{ of } 2 \times \tfrac{3}{5} = \tfrac{2}{5}. \quad \tfrac{2}{3} \text{ of } \$\tfrac{3}{5} = \$\tfrac{2}{5}.$$

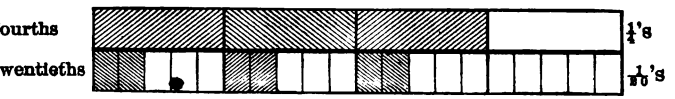
NOTE.—The answers in the two preceding problems, as in any other problems of the kind, are the same, and show that a fraction **of** a fraction is the same as a fraction **times** a fraction; $\frac{2}{3}$ of $\frac{3}{5} = \frac{2}{3} \times \frac{3}{5}$.

3. John ran $\frac{3}{4}$ of a mile in five minutes; Henry ran $\frac{2}{3}$ as far. How far did Henry run?



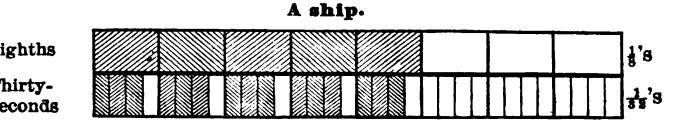
$\frac{1}{3}$ of $\frac{1}{4} = \frac{1}{12}$; $\frac{2}{3}$ of $\frac{1}{4} = \frac{2}{12}$; $\frac{2}{3}$ of $\frac{3}{4} = \frac{6}{12} = \frac{1}{2}$.

4. Sarah bought $\frac{2}{5}$ of a yard of ribbon at \$$\frac{3}{4}$ a yard. How much did the ribbon cost her?



$\frac{1}{5} \times \$\frac{1}{4} = \$\frac{1}{20}$. $\frac{2}{5} \times \$\frac{1}{4} = \$\frac{2}{20}$. $\frac{2}{5} \times \$\frac{3}{4} = \$\frac{6}{20} = \$\frac{3}{10}$.

5. Mr. Mason sold $\frac{3}{4}$ of his share of a ship. He owned $\frac{5}{8}$ of the ship. How much of the ship did he sell?



$\frac{1}{4}$ of $\frac{1}{8} = \frac{1}{32}$. $\frac{3}{4}$ of $\frac{1}{8} = \frac{3}{32}$. $\frac{3}{4}$ of $\frac{5}{8} = \frac{15}{32}$.

6. Jane picked $\frac{5}{8}$ of a bushel of strawberries; Edith picked $\frac{3}{4}$ as much. What part of a bushel did Edith pick? How many quarts? $\frac{3}{4} \times \frac{5}{8} = \frac{15}{32}$.

7. Mr. Dill owned $\frac{2}{3}$ of a farm. His brother owned $\frac{5}{6}$ as much. How much did the brother own?

8. What will $\frac{3}{4}$ of a yard of linen cost at \$$\frac{4}{5}$ a yard?

9. A book sold for \$$\frac{9}{10}$. Its cost was $\frac{2}{3}$ of the selling price. What was the cost price?

10. Mr. Halpin bought books for \$$\frac{4}{5}$ and sold them for $\frac{3}{4}$ of the cost price. What was the selling price?

11. If John's money is $\frac{6}{7}$ of Henry's money, and Henry has $\$\frac{3}{10}$, how much money has John?

12. Frank can build $\frac{3}{8}$ of $\frac{3}{4}$ of a wall in a week. What part of the wall can be built in $\frac{1}{6}$ of a week?

209. Find the value of the following:

Without Cancellation.		With Cancellation.	
1. $\frac{3}{4}$ of $\frac{3}{5}$.	*6.* $\frac{1}{3} \times \frac{5}{6}$.	*11.* $\frac{2}{3}$ of $\frac{5}{6}$.	*16.* $\frac{3}{4} \times \frac{2}{9}$.
2. $\frac{5}{6}$ of $\frac{1}{3}$.	*7.* $\frac{2}{5} \times \frac{9}{7}$.	*12.* $\frac{3}{4}$ of $\frac{8}{9}$.	*17.* $\frac{5}{6} \times \frac{9}{10}$.
3. $\frac{2}{3}$ of $\frac{4}{5}$.	*8.* $\frac{3}{5} \times \frac{9}{10}$.	*13.* $\frac{3}{8}$ of $\frac{1}{6}$.	*18.* $\frac{3}{8} \times \frac{4}{9}$.
4. $\frac{7}{8}$ of $\frac{1}{2}$.	*9.* $\frac{5}{6} \times \frac{5}{7}$.	*14.* $\frac{2}{5}$ of $\frac{3}{4}$.	*19.* $\frac{4}{7} \times \frac{7}{12}$.
5. $\frac{1}{2}$ of $\frac{7}{8}$.	*10.* $\frac{5}{7} \times \frac{5}{6}$.	*15.* $\frac{4}{5}$ of $\frac{10}{12}$.	*20.* $\frac{5}{9} \times \frac{3}{10}$.

210. To find a required part of a fraction, or to multiply a fraction by a fraction, multiply the numerators together for a new numerator, and the denominators together for a new denominator.

211. Cancellation is frequently used in multiplying fractions together. After indicating the multiplication the common factors in the different numerators and denominators are cancelled.

212. Find the cost of the following:

Notions.		Confections.	
dozen. $	yards. $	pounds. $	pounds. $
1. $\frac{2}{3}$ @ $\frac{3}{8}$.	*5.* $\frac{2}{3}$ @ $\frac{1}{2}$.	*9.* $\frac{1}{2}$ @ $\frac{3}{4}$.	*13.* $\frac{3}{4}$ @ $\frac{2}{5}$.
2. $\frac{1}{2}$ @ $\frac{3}{4}$.	*6.* $\frac{1}{4}$ @ $\frac{1}{2}$.	*10.* $\frac{1}{2}$ @ $\frac{4}{5}$.	*14.* $\frac{5}{8}$ @ $\frac{4}{5}$.
3. $\frac{3}{4}$ @ $\frac{4}{5}$.	*7.* $\frac{1}{4}$ @ $\frac{1}{2}$.	*11.* $\frac{1}{3}$ @ $\frac{3}{5}$.	*15.* $\frac{1}{4}$ @ $\frac{1}{2}$.
4. $\frac{5}{6}$ @ $\frac{9}{10}$.	*8.* $\frac{1}{2}$ @ $\frac{1}{4}$.	*12.* $\frac{1}{4}$ @ $\frac{2}{5}$.	*16.* $\frac{3}{4}$ @ $\frac{3}{5}$.

Dry Goods.		Groceries.	
yards. $	yards. $	pounds. $	pounds. $
17. $\frac{5}{8}$ @ $\frac{4}{10}$.	*21.* $\frac{2}{3}$ @ $\frac{1}{4}$.	*25.* $\frac{1}{2}$ @ $\frac{1}{3}$.	*29.* $\frac{3}{4}$ @ $\frac{3}{5}$.
18. $\frac{3}{4}$ @ $\frac{5}{6}$.	*22.* $\frac{3}{4}$ @ $\frac{4}{5}$.	*26.* $\frac{1}{4}$ @ $\frac{1}{3}$.	*30.* $\frac{7}{8}$ @ $\frac{3}{4}$.
19. $\frac{2}{3}$ @ $\frac{3}{5}$.	*23.* $\frac{5}{8}$ @ $\frac{4}{5}$.	*27.* $\frac{3}{4}$ @ $\frac{3}{5}$.	*31.* $\frac{2}{3}$ @ $\frac{5}{9}$.
20. $\frac{7}{8}$ @ $\frac{1}{7}$.	*24.* $\frac{7}{1}$ @ $\frac{3}{5}$.	*28.* $\frac{7}{8}$ @ $\frac{6}{7}$.	*32.* $\frac{5}{16}$ @ $\frac{2}{3}$.

213. Written Problems. 1. A barrel was $\frac{5}{6}$ full of flour. $\frac{9}{10}$ of the flour was used. What part of a barrel was used?

2. Charles has $\$\frac{7}{8}$ and Andrew $\frac{3}{7}$ as much. What part of a dollar has Andrew?

3. Jennie had $\$\frac{3}{4}$ and spent $\frac{7}{9}$ of it for ribbon. What did the ribbon cost her?

4. Matthew's Third Reader cost him $\$\frac{3}{8}$. A Second Reader cost him $\frac{2}{3}$ as much. What did the Second Reader cost him?

5. Thomas paid $\frac{5}{6}$ as much for his tie as for his gloves. His gloves cost $\$\frac{7}{8}$. What did the tie cost him?

214. To multiply a mixed number by an integer.

1. Mr. Tompkins sold 5 turkeys at $\$2\frac{1}{4}$ each. How much money should he receive?

$$5 \times \$\tfrac{1}{4} = \$\tfrac{5}{4} = \$1\tfrac{1}{4}\,;\ 5 \times \$2 = \$10\,;\ \$10 + \$1\tfrac{1}{4} = \$11\tfrac{1}{4}.$$

2. Mrs. Earl bought 4 napkin rings at $\$3\frac{1}{3}$ each. How much did the 4 rings cost her?

$$4 \times \$\tfrac{1}{3} = \$\tfrac{4}{3} = \$1\tfrac{1}{3}\,;\ 4 \times \$3 = \$12\,;\ \$12 + \$1\tfrac{1}{3} = \$13\tfrac{1}{3}.$$

3. Jane bought gingham for 5 aprons to contain $1\frac{3}{4}$ yards each. How many yards did she buy?

4. Clarence worked 6 days for $\$2\frac{1}{5}$ a day. How much money did he earn?

5. How much will 9 packages of tea weigh, if each package weighs $3\frac{5}{8}$ pounds?

6. What is the cost of a dozen yards of linen at $\$1\frac{3}{8}$ a yard?

215. Find by cancellation the cost of the following:

Fruits.			Drugs.			Carpets.			Notions.		
	bu.	$		lb.	$		yd.	$		doz.	$
1.	6 @	$2\frac{1}{3}$.	*4.*	3 @	$1\frac{2}{3}$.	*7.*	12 @	$1\frac{3}{4}$.	*10.*	20 @	$\frac{4}{5}$.
2.	8 @	$3\frac{3}{4}$.	*5.*	4 @	$2\frac{7}{8}$.	*8.*	30 @	$2\frac{1}{2}$.	*11.*	12 @	$\frac{5}{6}$.
3.	9 @	$4\frac{2}{3}$.	*6.*	5 @	$3\frac{4}{5}$.	*9.*	44 @	$1\frac{3}{4}$.	*12.*	15 @	$\frac{9}{10}$.

216. Oral Problems. 1. At $1\frac{1}{2}$ cents each, how much will it cost to launder 5 collars?

2. If elastic costs $2\frac{1}{2}$ cents a yard, what will 5 yards of elastic cost?

3. At $3\frac{1}{3}$ cents a mile, how much will it cost to ride 3 miles on the railroad? 5 miles?

4. What will be the charge for 10 yards of edging at $3\frac{1}{3}$ cents a yard?

5. How much does a newsboy pay for 4 papers at $2\frac{3}{4}$ cents each?

6. If papers cost $1\frac{4}{5}$ cents each, what will 10 papers cost?

7. How many yards of ribbon are there in 3 remnants each containing $2\frac{3}{8}$ yards?

8. If $4\frac{1}{8}$ yards of muslin are required for a child's dress, how many yards are required for 8 such dresses?

217. Written Problems. 1. How much will 20 volumes of a work cost at $\$4\frac{1}{4}$ a volume?

2. At $9\frac{3}{4}$ cents a pound, what will 120 pounds of beef cost?

The greater number is usually taken as the multiplicand.

$$\begin{array}{r} 120 \\ 9\frac{3}{4} \\ \hline 30 = \frac{1}{4} \\ 3 \\ \hline 90 = \frac{3}{4} \\ 1080 \\ \hline \$11.70 \text{ Ans.} \end{array}$$

3. How much will a man's board for 30 days cost him, if it costs $\$1\frac{2}{3}$ a day?

4. What will a gross, or 12 dozen, of lemons cost at $3\frac{1}{4}$ cents for each lemon?

5. At $\$20\frac{7}{8}$ an acre what will 800 acres of land cost?

6. If each pole is $18\frac{2}{3}$ feet long, what will be the united length of 99 poles?

7. What will be the cost of 250 straw hats at $\$1\frac{4}{5}$ each?

8. When flour sells for $\$9\frac{3}{8}$ per barrel, how much will 48 barrels cost?

9. Mr. James bought 18 tons of coal at $\$4\frac{3}{4}$ a ton. What was the amount of his bill?

10. How much will 12 clocks cost at $\$18\frac{2}{3}$ each?

11. If Frank earns $\$1\frac{3}{5}$ a day, how much will he earn in 5 months of 25 working days each?

12. Lillie is $1\frac{5}{6}$ years old. Her father is 24 times as old. How old is the father?

13. In each of 5 coal bins there are $12\frac{9}{10}$ tons of coal. How many tons in all are there?

218. To multiply a mixed number by a mixed number.

1. Ralph sold $1\frac{3}{4}$ bushels of berries at $\$1\frac{1}{2}$ a bushel. How much should he receive for them?

$$1\tfrac{3}{4} = \tfrac{7}{4};\ \$1\tfrac{1}{2} = \$\tfrac{3}{2};\ \tfrac{7}{4} \times \$\tfrac{3}{2} = \$\tfrac{21}{8} = \$2\tfrac{5}{8}.$$

2. Edith bought $3\frac{1}{2}$ yards of silk at $\$2\frac{1}{4}$ a yard. How much did it cost?

$$3\tfrac{1}{2} = \tfrac{7}{2};\ \$2\tfrac{1}{4} = \$\tfrac{9}{4};\ \tfrac{7}{2} \times \$\tfrac{9}{4} = \$\tfrac{63}{8} = \$7\tfrac{7}{8}.$$

3. What cost $2\frac{1}{2}$ yards of cloth at $\$1\frac{1}{4}$ per yard?

4. If a wheel moves $3\frac{1}{3}$ feet in turning around once, how far will it move in turning around $2\frac{3}{4}$ times?

5. If a horse trots $7\frac{1}{3}$ miles an hour, how far will it trot in $2\frac{1}{2}$ hours?

219. Find the value of:

Without Cancellation.		With Cancellation.	
yards. $	pounds. $	yards. $	pounds. $
1. $1\frac{1}{4} \times 1\frac{1}{2}$.	*5.* $2\frac{1}{4}$ @ $1\frac{1}{2}$.	*9.* $4\frac{2}{3}$ @ $2\frac{1}{7}$.	*13.* $2\frac{3}{8}$ @ $1\frac{1}{5}$.
2. $1\frac{2}{5} \times 2\frac{1}{4}$.	*6.* $1\frac{1}{8}$ @ $1\frac{1}{2}$.	*10.* $3\frac{1}{3}$ @ $2\frac{4}{5}$.	*14.* $1\frac{6}{8}$ @ $2\frac{4}{7}$.
3. $2\frac{1}{6} \times 3\frac{1}{2}$.	*7.* $5\frac{1}{2}$ @ $1\frac{1}{5}$.	*11.* $2\frac{1}{4}$ @ $3\frac{1}{3}$.	*15.* $3\frac{1}{4}$ @ $6\frac{2}{3}$.
4. $5\frac{1}{2} \times 3\frac{1}{2}$.	*8.* $6\frac{1}{2}$ @ $1\frac{1}{3}$.	*12.* $3\frac{1}{8}$ @ $2\frac{2}{5}$.	*16.* $1\frac{5}{16}$ @ $3\frac{1}{3}$.

220. To multiply with a mixed number, when the numbers are not large, express each as an improper fraction, and then multiply, cancelling, if possible.

221. Written Problems. 1. What will be the cost of $6\frac{2}{3}$ yards of calico at $8\frac{3}{4}$ cents a yard?

2. If a man walks $4\frac{3}{8}$ miles in an hour, how far can he walk in $4\frac{4}{5}$ hours?

3. What will a dress of $10\frac{7}{8}$ yards of silk cost at $\$2\frac{2}{3}$?

4. If a pipe discharge $6\frac{3}{4}$ gallons of water from a cistern in a minute, how much will it discharge in $3\frac{1}{3}$ minutes?

5. How much will be charged for $2\frac{3}{4}$ pounds of beef at $\$.16\frac{1}{2}$ a pound?

6. There are $16\frac{1}{2}$ feet in a rod. How many feet are there in $4\frac{2}{3}$ rods?

7. What cost $5\frac{1}{2}$ baskets of peaches at $\$1\frac{3}{8}$ per basket?

8. What is Mr. Cole's hotel bill for $5\frac{5}{7}$ weeks at $\$17\frac{1}{2}$?

9. If a steamer travels $18\frac{3}{4}$ miles an hour, how far will it travel in $5\frac{3}{5}$ hours?

222. When the numbers are large, cancellation is not generally used. The larger number is written as the multiplicand with the smaller number as the multiplier. First find the product by the fraction. If this product is large, it is written as the first partial product.

223. Copy, and complete:

1.	2.	3.	4.	5.	6.
$\$48\frac{1}{2}$	$\$32$	$\$50\frac{2}{3}$	$\$25$	$\$75\frac{2}{3}$	$\$58\frac{7}{8}$
6	$7\frac{1}{4}$	8	$4\frac{4}{5}$	9	4
$\$291$	2	$5\frac{1}{3}$			

7.	8.	9.	10.	11.	12.
$95\frac{2}{3}$	76	85	42	$72\frac{5}{6}$	$50\frac{7}{8}$
24	$15\frac{3}{4}$	$36\frac{4}{5}$	$20\frac{5}{6}$	18	48

13.	14.	15.	16.	17.	18.
$30\frac{5}{6}$	86	100	$98\frac{2}{3}$	$82\frac{1}{4}$	99
12	$10\frac{1}{2}$	$45\frac{3}{4}$	27	15	$45\frac{7}{9}$

DIVISION.

224. To divide an integer by a fraction.

1. If one apron can be made from $\frac{2}{3}$ of a yard of calico, how many aprons can be made from 2 yards?

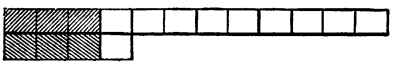
2 contains $\frac{2}{3}$ how many times?

$2 \div \frac{2}{3} = 2 \times 3 \div 2$; or $2 \times \frac{3}{2} = 3$.

There will be as many aprons in 2 yards as there are times $\frac{2}{3}$ of a yard. In 2 yards there are $\frac{6}{3}$. If $\frac{2}{3}$ yards make 1 apron, $\frac{6}{3}$ will make as many aprons as 2 is contained times in 6, or 3. Answer, 3 aprons.

2. How many yards of linen, at $\$\frac{3}{4}$ per yard, can be bought for \$3?

3 contains $\frac{3}{4}$ how many times?



$3 \div \frac{3}{4} = 3 \times 4 \div 3$; or $3 \times \frac{4}{3} = 4$.

For \$3 as many yards can be bought as $\$\frac{3}{4}$ is contained times in \$3. Find how many fourths there are in \$3 by multiplying by the denominator of the fraction; then find how many times this product contains $\$\frac{3}{4}$ by dividing by the numerator of the fraction.

3. At $\$\frac{3}{4}$ per yard, how many yards can be bought for \$6?

4. How many boys, at $\$\frac{5}{8}$ each, can be engaged to work for \$5 a day?

5. If a pitcher holds $\frac{3}{8}$ of a gallon of milk, how many times must it be filled to measure 3 gallons?

6. How many pen-knives can James buy for \$6, if each pen-knife costs $\$\frac{3}{8}$?

7. Five is how many times fifteen-sixteenths?

225. To divide an integer by a fraction, multiply the integer by the denominator and then divide by the numerator of the fraction; or *invert the divisor and multiply.*

226. Find the quotients:

Without Cancellation.		With Cancellation.	
1. $7 \div \frac{5}{8}$.	*6.* $12 \div \frac{1}{2}$.	*11.* $5 \div \frac{5}{9}$.	*16.* $4 \div \frac{8}{10}$.
2. $6 \div \frac{5}{9}$.	*7.* $12 \div \frac{5}{6}$.	*12.* $3 \div \frac{6}{7}$.	*17.* $9 \div \frac{3}{4}$.
3. $5 \div \frac{4}{5}$.	*8.* $15 \div \frac{1}{2}$.	*13.* $4 \div \frac{8}{11}$.	*18.* $10 \div \frac{2}{5}$.
4. $10 \div \frac{3}{4}$.	*9.* $15 \div \frac{2}{3}$.	*14.* $6 \div \frac{8}{12}$.	*19.* $12 \div \frac{4}{7}$.
5. $11 \div \frac{1}{2}$.	*10.* $20 \div \frac{3}{5}$.	*15.* $8 \div \frac{10}{15}$.	*20.* $15 \div \frac{3}{8}$.

227. Oral Problems. 1. For \$8, how many pairs of gloves, at $\$\frac{2}{3}$ a pair, can be bought?

2. For how many days, at $\$\frac{3}{4}$ a day, does a laborer work to earn \$9?

3. How many pails, containing $\frac{5}{8}$ of a gallon each, will be required to hold 5 gallons of milk?

4. Thomas received \$3 for working $\frac{5}{6}$ of a week. What were his wages per week?

5. Among how many families can 4 barrels, containing each $2\frac{1}{2}$ bushels of potatoes, be divided, so as to give to each family $\frac{1}{2}$ of a bushel?

228. Written Problems. 1. At $\$\frac{3}{8}$ a bushel, how many bushels of potatoes can be bought for \$60?

2. For how many baskets of pears, at $\$\frac{3}{8}$ a basket, will \$12 pay?

3. How long will it take a pipe to empty a cistern containing 125 barrels of water, if it empties $\frac{5}{16}$ of a barrel every minute?

4. From a barrel of flour containing 196 pounds, how many loaves of bread can be made, if for each loaf $\frac{4}{5}$ of a pound of flour is used?

5. How many books costing $\$\frac{9}{10}$ can be bought for \$45?

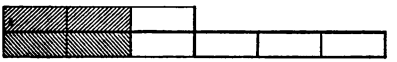
6. John paid $\$\frac{3}{10}$ every day for car fare. For how many days will \$20 pay his car fare?

7. At $\$\frac{19}{20}$ each, how many hats can be bought for \$38?

229. To divide a fraction by an integer.

1. If 2 yards of lace edging will make the border for one apron, how many such borders will 6 yards of edging make? 4 yards? 2 yards? $\frac{2}{3}$ of a yard? $\frac{2}{3}$ divided by 2 equals?

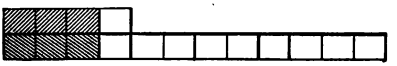
$\frac{2}{3}$ divided by 2 = ?



$\frac{2}{3} \div 2 = \frac{2}{6}$, or $\frac{1}{3}$.

2. If a yard of broadcloth costs \$3, what part of a yard can be bought for \$$\frac{3}{4}$? \$$\frac{3}{4}$ divided by 3 equals?

$\frac{3}{4}$ divided by 3 = ?



$\frac{3}{4} \div 3 = \frac{3}{12}$, or $\frac{1}{4}$.

3. What part of a bushel of pears, at \$2 a bushel, can be bought for \$$\frac{3}{4}$? \$$\frac{3}{4}$ divided by 2 equals?

4. If a man earns \$$\frac{4}{5}$ in 4 hours, how much does he earn in one hour? \$$\frac{4}{5}$ divided by 4 equals?

5. If 5 yards of ribbon cost \$$\frac{5}{8}$, what does one yard cost?

The answer will be the same whether the numerator is divided, or the denominator is multiplied by the integer, and then reduced. Divide the numerator, if possible, as the result will be in lower terms. Express the answer in its lowest terms.

6. If a garden containing $\frac{3}{7}$ of an acre is divided into 3 equal parts, what fraction of an acre will each part contain?

7. How much coal, at \$5 a ton, can be bought for \$$\frac{5}{10}$?

8. Henry ran 3 miles in $\frac{7}{12}$ of an hour. In what time did he run one mile?

9. If one-seventh is divided by seven, what is the quotient?

230. To divide a fraction by an integer, divide the numerator or multiply the denominator of the fraction by the integer.

231. Find the quotients in the following:

1. $\frac{4}{5} \div 2$.	*4.* $\frac{2}{3} \div 5$.	*7.* $\frac{3}{5} \div 2$.	*10.* $\frac{6}{9} \div 3$.	*13.* $\frac{9}{10} \div 3$.
2. $\frac{8}{9} \div 4$.	*5.* $\frac{4}{5} \div 3$.	*8.* $\frac{2}{5} \div 2$.	*11.* $\frac{5}{6} \div 3$.	*14.* $\frac{9}{10} \div 2$.
3. $\frac{9}{10} \div 3$.	*6.* $\frac{3}{4} \div 5$.	*9.* $\frac{6}{7} \div 3$.	*12.* $\frac{7}{8} \div 2$.	*15.* $\frac{9}{12} \div 6$.

232. Oral Problems. 1. If Henry has $\frac{5}{8}$ of an orange, and divides it equally among 5 boys, what part of the orange will each boy receive?

2. If Henry divides $\frac{3}{4}$ of an orange equally among 5 boys, how much will each boy receive?

3. What will one yard of lace cost, if 8 yards cost \$$\frac{4}{5}$?

4. If John earns \$$\frac{9}{10}$ in 3 hours, how much does he earn in one hour?

5. How much will Howard earn in one hour, if he earns \$$\frac{9}{10}$ in 12 hours?

6. Sarah paid \$$\frac{3}{4}$ for 9 dozen buttons. How much did the buttons cost her a dozen?

7. Thomas walked $\frac{7}{8}$ of a mile in 14 minutes. How far did he walk in one minute?

233. Written Problems. 1. For 40 spools of basting thread \$$\frac{4}{5}$ was paid. How much did each spool cost?

2. If a boy earns \$$\frac{3}{5}$ per hour, how much does he earn per minute?

3. Jane bought a bushel of blackberries for \$$\frac{3}{10}$. How much did each quart cost her?

32 quarts equal 1 bushel.

4. Frances had $\frac{5}{8}$ of a yard of ribbon, and cut it into 50 equal parts. How long was each part?

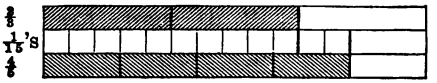
5. A baker sold 10 dozen small cakes for \$$\frac{6}{5}$. How much did he receive for each cake?

6. What will one button cost, if a gross (12 doz.) costs \$$\frac{9}{10}$?

234. To divide a fraction by a fraction.

1. Frank had \$$\frac{2}{3}$. How many dozen muslin ties, at \$$\frac{4}{5}$ a dozen, could he buy ?

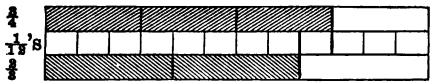
$\frac{2}{3}$ contains $\frac{4}{5}$ how many times ?



$\frac{2}{3} \div \frac{4}{5} = \frac{10}{15} \div \frac{12}{15} = \frac{10}{12}\ (\frac{2}{3} \times \frac{5}{4}) = \frac{5}{6}$.

2. James walked $\frac{3}{4}$ of a mile; John, $\frac{2}{3}$ of a mile. James walked how many times as far as John ?

$\frac{3}{4}$ contains $\frac{2}{3}$ how many times ?



For comparison the $\frac{1}{4}$'s and $\frac{1}{3}$'s are reduced to $\frac{1}{12}$'s, giving $\frac{9}{12}$ and $\frac{8}{12}$; $\frac{9}{12}$ contains $\frac{8}{12}$ as often as 9 contains 8, or $\frac{9}{8} = 1\frac{1}{8}$ times. The 9 was obtained by multiplying the numerator of the dividend by the denominator of the divisor; and the eight, by multiplying the denominator of the dividend by the numerator of the divisor.

3. How many dozen oranges at \$$\frac{9}{20}$ a dozen can be bought for \$$\frac{3}{10}$? How many oranges?

4. What number multiplied by $\frac{7}{8}$ gives $\frac{3}{4}$?

235. To divide a fraction by a fraction, invert the divisor and proceed as in multiplication.

The divisor is inverted, but not the dividend.

236. Find the quotients:

Without Cancellation.		With Cancellation.	
1. $\frac{3}{7} \div \frac{8}{9}$.	*6.* $\frac{8}{9} \div \frac{3}{8}$.	*11.* $\frac{2}{5} \div \frac{4}{9}$.	*16.* $\frac{15}{18} \div \frac{5}{12}$.
2. $\frac{6}{7} \div \frac{5}{8}$.	*7.* $\frac{7}{12} \div \frac{6}{11}$.	*12.* $\frac{4}{7} \div \frac{8}{14}$.	*17.* $\frac{5}{9} \div \frac{15}{18}$.
3. $\frac{4}{9} \div \frac{5}{11}$.	*8.* $\frac{5}{6} \div \frac{4}{5}$.	*13.* $\frac{3}{8} \div \frac{6}{7}$.	*18.* $\frac{6}{11} \div \frac{12}{22}$.
4. $\frac{5}{8} \div \frac{7}{9}$.	*9.* $\frac{6}{11} \div \frac{7}{8}$.	*14.* $\frac{5}{6} \div \frac{11}{12}$.	*19.* $\frac{3}{8} \div \frac{9}{24}$.
5. $\frac{9}{10} \div \frac{5}{7}$.	*10.* $\frac{9}{10} \div \frac{8}{9}$.	*15.* $\frac{3}{4} \div \frac{5}{8}$.	*20.* $\frac{5}{7} \div \frac{10}{21}$.

237. Written Problems. 1. At $\$\frac{2}{3}$ a yard, how many yards of cloth can be bought for $\$\frac{3}{4}$? For $\$\frac{1}{2}$?

2. If a train travels $\frac{7}{8}$ of a mile in a minute, how long will it be in travelling $\frac{1}{2}$ of a mile? $\frac{2}{3}$ of a mile? $\frac{3}{4}$ of a mile? $\frac{4}{5}$ of a mile?

3. How many pounds of butter, at $\$\frac{3}{10}$ a pound, can be bought for $\$\frac{1}{5}$? $\$\frac{2}{5}$? $\$\frac{1}{3}$? $\$\frac{2}{3}$? $\$\frac{1}{2}$? $\$\frac{3}{8}$? $\$\frac{4}{5}$?

4. If milk sells for $\$\frac{1}{12}$ a quart, how many quarts can be bought for $\$5$? For $\$\frac{5}{8}$? For $\$\frac{3}{4}$?

5. A farmer owned $\frac{3}{4}$ of a farm; and his son, $\frac{3}{50}$ of it. The father owned how many times as much as the son?

6. How many pitchers of syrup can be taken from a pail containing $\frac{3}{25}$ of a barrel, if the pitcher holds $\frac{1}{100}$ of a barrel?

7. A race track was $\frac{9}{10}$ of a mile in length. How long a time does a horse take in travelling around it once, at the rate of $\frac{15}{34}$ of a mile in a minute?

8. How many rolls can be made from $\frac{7}{8}$ of a pound of flour, if one ounce is required for each roll?

9. At $\$\frac{3}{4}$ a basket, how many baskets of peaches can be bought for $\$\frac{9}{10}$?

10. If it is $\frac{2}{3}$ of a yard around the wheel of a little wagon, how many times will the wheel turn in going $\frac{8}{9}$ of a yard?

11. Edgar earns $\$\frac{5}{6}$ per hour. In what time does he earn $\$\frac{7}{8}$?

12. If Martha can do $\frac{4}{5}$ of a piece of work in one hour, in what time should she do $\frac{14}{15}$ of the work?

13. The price of butter in one store is $\$\frac{3}{10}$ per pound, and in another store, $\$\frac{1}{4}$ per pound. The butter in the first store costs how many times as much as that in the second store?

14. A remnant of calico containing $\frac{7}{8}$ of a yard is equal to how many remnants containing $\frac{1}{4}$ of a yard?

15. How many yards of cloth must be sold to gain $\$\frac{19}{20}$, if $\$\frac{1}{5}$ is made on each yard?

16. $\frac{12}{13}$ is how many times $\frac{24}{39}$?

238. To divide with mixed numbers, first reduce the mixed numbers to improper fractions, and then divide as with proper fractions.

239. Find the quotients in the following:

Without Cancellation.

1. $\frac{2}{5} \div 2\frac{1}{3}$.	*5.* $2\frac{5}{6} \div 7$.	*9.* $\frac{5}{9} \div 2\frac{2}{5}$.	*13.* $18 \div 2\frac{1}{2}$.
2. $1\frac{1}{7} \div 2\frac{1}{5}$.	*6.* $3\frac{2}{3} + 3\frac{3}{4}$.	*10.* $3\frac{3}{4} \div 1\frac{1}{3}$.	*14.* $2\frac{1}{2} \div 18$.
3. $1\frac{1}{5} \div 3\frac{1}{2}$.	*7.* $6 \div 2\frac{1}{7}$.	*11.* $7\frac{1}{2} \div 5\frac{1}{3}$.	*15.* $2\frac{2}{5} \div 11$.
4. $5 \div 5\frac{3}{5}$.	*8.* $\frac{5}{6} \div 5\frac{2}{3}$.	*12.* $6\frac{2}{3} \div 2\frac{3}{4}$.	*16.* $11 \div 2\frac{2}{5}$.

With Cancellation.

1. $3\frac{1}{3} \div 5$.	*5.* $2 \div 1\frac{3}{5}$.	*9.* $7 \div 4\frac{2}{3}$.	*13.* $2\frac{1}{2} \div 1\frac{2}{3}$.
2. $4\frac{2}{3} \div 7$.	*6.* $6 \div 1\frac{5}{7}$.	*10.* $2\frac{2}{5} \div 6$.	*14.* $3\frac{3}{8} \div 4\frac{1}{2}$.
3. $5\frac{1}{4} \div 3$.	*7.* $5 \div 1\frac{1}{9}$.	*11.* $8 \div 1\frac{1}{3}$.	*15.* $6\frac{4}{5} \div 1\frac{7}{10}$.
4. $2\frac{1}{2} \div 10$.	*8.* $4 \div 2\frac{2}{3}$.	*12.* $3\frac{1}{5} \div 8$.	*16.* $12 \div 2\frac{2}{3}$.

In dividing by an integer, divide the numerator or multiply the denominator by the integer; or, consider the integer a fraction with 1 for a denominator; invert and multiply. Thus, $3\frac{1}{3} \div 5 : 5 = \frac{5}{1}$. $3\frac{1}{3} \div \frac{5}{1} = \frac{\overset{2}{\cancel{10}}}{\cancel{3}} \times \frac{1}{\cancel{5}} = \frac{2}{3}$. Ans.

240. Written Problems. 1. For $\$2\frac{1}{2}$, how many yards of cloth can be bought at $\$1\frac{1}{8}$ a yard?

2. If pears cost $\$1\frac{3}{4}$ a basket, how many baskets can be bought for $\$2\frac{5}{8}$?

3. How many neck scarfs can be made from $15\frac{3}{4}$ yards of ribbon, if each scarf requires $\frac{7}{8}$ of a yard?

4. How much does Mr. Jones earn in one week, if he earns $\$52\frac{1}{4}$ in $3\frac{1}{6}$ weeks?

5. If each dress requires $9\frac{3}{8}$ yards of silk, how many dresses can be made from $56\frac{1}{4}$ yards of silk?

6. For how many days' board at a hotel will $\$49\frac{1}{2}$ pay, at the rate of $\$2\frac{3}{4}$ a day?

7. At $\$8\frac{1}{2}$ a month, for how many months' rent will $\$59\frac{1}{2}$ pay? $\$76\frac{1}{2}$?

241. To find a number, a part of it being given.

1. Jane was 10 years old, but she was only $\frac{2}{3}$ as old as John. How old was John?

If 10 equals $\frac{2}{3}$ of John's age, $\frac{1}{3}$ equals $\frac{1}{2}$ of 10 years, or 5 years, and $\frac{3}{3}$, or John's age, equals 3 times 5 years, or 15 years.

2. Edgar had \$25, which was $\frac{5}{6}$ as much as what Fred had. How much money did Fred have?

3. Mary paid \$.18 for $\frac{2}{3}$ of a yard of ribbon. How much did the ribbon cost a yard?

4. If 3 quarts of milk cost \$.24, what will a gallon cost?

5. Mr. Bell sold books for \$27, which was $\frac{9}{10}$ of the cost. What did the books cost?

6. 72 is $\frac{6}{7}$ of what number?

242. To find the number of which a part is given, divide the given part by the numerator, and then multiply by the denominator of the fraction.

243. Find the number of which

1. 12 is $\frac{2}{3}$.	*4.* 20 is $\frac{4}{5}$.	*7.* 36 is $\frac{4}{9}$.	*10.* 60 is $\frac{3}{4}$.
2. 10 " $\frac{5}{6}$.	*5.* 25 " $\frac{5}{7}$.	*8.* 45 " $\frac{5}{8}$.	*11.* 75 " $\frac{5}{6}$.
3. 15 " $\frac{3}{4}$.	*6.* 18 " $\frac{9}{10}$.	*9.* 50 " $\frac{10}{11}$.	*12.* 90 " $\frac{2}{3}$.

244. Written Problems. 1. Mr. Thomson received \$12,000 for his share of city lots, of which he owned $\frac{5}{8}$. For what sum were the lots sold?

2. Carrie paid \$1.26 for $\frac{7}{8}$ of a yard of silk. How much did she pay per yard for the silk?

3. If $\frac{5}{6}$ of a dozen of kid gloves sell for \$22.80, for how much does one dozen sell?

4. Henry is $\frac{5}{12}$ as old as his father. How old is the father, if Henry is 20 years old?

5. A pole 40 feet long is $\frac{8}{9}$ as long as another pole. How long is the other pole?

6. If Frank's watch, costing \$45, cost only $\frac{9}{20}$ as much as his father's watch, how much did his father's watch cost ?

245. To find what part one number is of another.

1. A paper is bought for 3 cents and sold for 4 cents. The cost price is what part of the selling price ?

1 cent is $\frac{1}{4}$ of 4 cents ; and 3 cents are $\frac{3}{4}$ of 4 cents.

2. If oranges are bought for 3 cents and sold for 5 cents each, what is the gain ? What part is this of 3 cents, or the cost price ?

3. What part of his money does a bookseller lose, if he buys blank books for 10 cents and sells them for 2 cents less ?

4. If grapes are bought for 6 cents and sold for 8 cents a pound, the profit is what part of the cost ?

MISCELLANEOUS PROBLEMS.

246. Oral Problems. 1. Mr. Jenkins bought a clock for \$$2\frac{3}{4}$ and sold it so as to gain \$$1\frac{1}{2}$. What did he sell it for ?

2. Mr. Richards sold $\frac{1}{4}$ of his farm to one man and $\frac{1}{6}$ of it to another man. What part did he have left ?

3. If Henry can do a piece of work in 24 days, what part of it can he do in 4 days ?

4. A man bought $6\frac{1}{2}$ bushels of wheat at one time and again, $2\frac{1}{3}$ bushels. How many bushels in all did he buy ?

5. At \$$\frac{1}{10}$ per pound, how many pounds of meat can be bought for \$$\frac{1}{2}$?

6. If a yard of cloth costs \$$2\frac{1}{2}$, what will $1\frac{1}{2}$ yards cost ?

7. If $\frac{2}{3}$ of a pound of coffee costs \$.24, what will one pound cost ?

8. How many yards of silk can be bought for \$8, if $2\frac{1}{3}$ yards cost \$5 ?

9. What part of a dollar does one bushel of corn cost, if 4 bushels cost \$$3\frac{2}{3}$?

10. Albert had \$.36 and spent $\frac{2}{3}$ of it. How much did he have left ?

11. James bought a watch for \$$20\frac{2}{3}$ and sold it for \$$5\frac{1}{4}$ more than he gave for it. How much did he receive for it ?

12. The sum of two fractions is $\frac{5}{8}$ and one of them is $\frac{2}{5}$. What is the other fraction ?

13. A pole stands so that $\frac{1}{3}$ of it is in the mud, $\frac{1}{5}$ in the water, and the rest is above the water. How much of the pole is above the water ?

14. If $\frac{1}{2}$ of a barrel of flour costs \$$4\frac{1}{2}$, how much will $\frac{2}{3}$ of a barrel cost ?

15. Mr. Frank bought 4 bushels of corn, paying \$$\frac{5}{8}$ a bushel, and had \$40 left. How much money did he have at first ?

16. A merchant having 40 yards of cloth sold $\frac{3}{5}$ of it for \$24. How much did he receive per yard for the cloth ?

17. How many quarts of berries at 6 cents a quart will pay for $3\frac{3}{5}$ yards of ribbon at 10 cents a yard ?

18. Mr. Samuels sold a hat for \$12, which was $\frac{6}{5}$ of what the hat cost him. How much did the hat cost him ?

19. A man sold a cow for \$21 which was $\frac{7}{10}$ of what the cow cost. How much did the cow cost ?

20. How much will $\frac{2}{3}$ of 9 yards of cloth cost at \$9 a yard ?

21. Mr. Price had \$$2\frac{3}{4}$. He divided it equally among some boys, giving each boy \$$\frac{1}{4}$. How many boys were there ?

22. At $1\frac{2}{3}$ cents each, how much will $2\frac{1}{2}$ dozen eggs cost ?

23. Mrs. Marshall bought 6 mats at \$$\frac{3}{4}$ each and then had \$10 left. How much money did she have at first ?

24. Fred had \$$\frac{4}{5}$ and gave $\frac{3}{4}$ of it for a knife. What part of a dollar did the knife cost him ?

25. One man earns $\$1\frac{3}{8}$ in a day, and another man earns $\$1\frac{3}{4}$. How much do both earn in one day?

26. Mr. Grigg had 100 acres of land. He sold $\frac{4}{5}$ of it. How many acres did he have left?

27. How much will $5\frac{1}{2}$ yards of lace cost, if $\frac{1}{2}$ of a yard cost 5 cents?

28. What will $\frac{3}{4}$ of 2 yards of lace cost, if 5 yards cost 25 cents?

29. If a yard of cloth costs $\$\frac{8}{9}$, how much will $\frac{3}{8}$ of a yard cost?

30. How much will $1\frac{1}{2}$ yards of silk plush cost, if $\frac{2}{3}$ of a yard cost $4?

247. Written Problems. 1. How deep is a well sunk through sand $17\frac{3}{4}$ feet, through clay $8\frac{2}{3}$ feet, through slate $21\frac{5}{12}$ feet, and through other stone $16\frac{1}{2}$ feet?

2. From halibut weighing $63\frac{3}{4}$ pounds, a fish dealer sold $8\frac{5}{6}$ pounds, $7\frac{1}{4}$ pounds, $4\frac{1}{2}$ pounds, and $12\frac{7}{8}$ pounds. How many pounds were left?

3. A farmer sold a cow for $\$26\frac{2}{3}$, and fifteen sheep for $\$52\frac{1}{2}$. The purchaser paid for them with a $100 bill. How much change should he receive?

4. A merchant sold two pieces of broadcloth, one containing $10\frac{3}{4}$ yards, and the other $11\frac{2}{3}$ yards, at $\$1\frac{1}{2}$ per yard. What was the amount of the bill?

5. At $\$3\frac{3}{4}$ per day, how much can a man earn in $20\frac{2}{3}$ days?

6. If a bird flies $12\frac{3}{4}$ miles in $3\frac{1}{2}$ hours, how far will it fly in $6\frac{2}{3}$ hours?

7. If $15\frac{1}{8}$ baskets of peaches are bought for $\$24\frac{1}{4}$, how much does each basket cost?

8. A man paid $5,250 for a house, which was $\frac{3}{7}$ of all his property. How much was he worth?

9. What is the cost of 5 dozen eggs at $3\frac{3}{4}$ cents for each egg? What is the cost of 10 dozen?

10. Mr. Briggs paid \$$39\frac{3}{5}$ for a watch, \$$11\frac{4}{5}$ for a chain, \$$7\frac{3}{4}$ for a gold pencil, \$$15\frac{7}{10}$ for a silver pitcher, and \$$65\frac{1}{2}$ for a pair of bracelets. He had \$$160\frac{4}{5}$ left in his purse. How much did he have at first?

11. A farmer has a farm containing $140\frac{9}{16}$ acres. He sells to two men $15\frac{3}{4}$ acres and $60\frac{7}{8}$ acres. How many acres has he left?

12. From a bin containing $568\frac{1}{2}$ bushels of wheat there were sold at different times $187\frac{1}{4}$ bushels, $83\frac{1}{2}$ bushels, and $148\frac{2}{5}$ bushels. How many bushels were left?

13. Mr. Gates owes Mr. Haskins a bill of \$$190\frac{3}{4}$. In part payment Mr. Gates works 42 days at \$$3\frac{1}{2}$ per day. How much money does he still owe on the bill?

14. A drover bought 18 lambs at \$$3\frac{17}{20}$ each, and a cow. They all cost \$100. What was the cost of the cow?

15. A tailor cut 18 suits of $7\frac{4}{5}$ yards each from a piece of cloth, and then he had $11\frac{7}{8}$ yards left. How many yards did he have at first?

16. If $9\frac{3}{4}$ tons of hay cost \$$121\frac{7}{8}$, how many tons can be bought for \$175?

17. If Mr. Henry is $48\frac{1}{2}$ years old and he has lived $4\frac{2}{3}$ times as long as his son, how old is his son?

18. Mr. Phillip bought three crocks of butter weighing $15\frac{5}{16}$, $19\frac{3}{4}$, and $17\frac{1}{8}$ pounds. The empty crocks weigh $5\frac{3}{16}$, $5\frac{3}{4}$, and $5\frac{7}{8}$ pounds. How many pounds of butter were there in the crocks?

19. Mr. Hale sells three pieces of muslin containing $35\frac{3}{4}$ yards, $38\frac{1}{2}$ yards, and $42\frac{1}{4}$ yards at \$$\frac{1}{6}$ per yard. What is the amount of the bill?

20. If a man can build $2\frac{2}{5}$ rods of wall in one day, how many rods can he build in $6\frac{1}{2}$ days?

21. James can walk $9\frac{1}{2}$ miles in $2\frac{1}{9}$ days. How far can he walk in $14\frac{3}{4}$ days?

22. If Mr. Mills buys 100 tons of hay and, reserving 15 tons for himself, sells the remainder at $\$5\frac{4}{5}$ per ton, how much money does he receive?

23. Mr. Johnson owned a farm containing 100 acres, and sold $27\frac{1}{2}$ acres to one man and $\frac{1}{2}$ of the remainder to another man. How much did he sell to the second man?

24. What is the entire cost of $10\frac{1}{2}$ pounds of beef at $16\frac{2}{3}$ cents a pound, and $24\frac{3}{4}$ quarts of vinegar at $7\frac{3}{4}$ cents a quart?

25. Mr. Franklin earning $\$23\frac{3}{4}$ per week, spent $\$18\frac{2}{3}$ per week. In how many weeks can he save enough to pay a debt of $495?

26. If a man pays $312 for $\frac{3}{7}$ of 9 acres of land, what will $1\frac{1}{7}$ acres cost?

27. If $\frac{3}{5}$ of $\frac{5}{6}$ of a barrel of flour costs $\$3\frac{1}{2}$, what will $\frac{1}{2}$ of $\frac{4}{7}$ of 21 barrels cost?

28. A merchant sells $12\frac{2}{3}$ yards of cloth at $\$2\frac{4}{7}$ per yard, $13\frac{3}{4}$ yards at $\$1\frac{4}{5}$ per yard, and $16\frac{2}{3}$ yards at $\$2\frac{1}{4}$ per yard. How much money should he receive?

29. If a man makes $\$1\frac{17}{20}$ on every table that he sells, how many tables must he sell to make $\$27\frac{3}{4}$?

30. How many tons of coal at $\$7\frac{3}{10}$ a ton will pay for $6\frac{1}{2}$ barrels of flour at $\$8\frac{3}{4}$ per barrel?

31. What is the cost of $5\frac{7}{8}$ bales of sheeting, each bale containing $41\frac{3}{4}$ yards at $\$.12\frac{1}{2}$ per yard?

32. How many 47ths are there in $345\frac{21}{47}$?

33. Mr. Small bought a wagon for $\$85\frac{5}{6}$ and a sleigh for $\$69\frac{3}{4}$. He sold both for $\$236\frac{2}{3}$. Did he gain or lose, and how much?

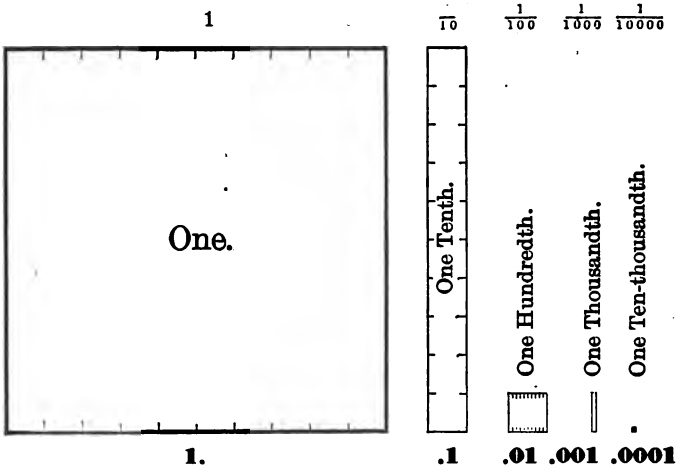
34. From a piece of cloth containing 345 yards, there were cut at different times $84\frac{4}{5}$ yards, $93\frac{7}{8}$ yards, and $74\frac{3}{4}$ yards. How many yards were left in the piece?

35. What number is that which is $15\frac{2}{3}$ more than $17\frac{1}{4}$ times $30\frac{1}{4}$?

DECIMALS

AND

UNITED STATES MONEY.



248. Show by the diagram the difference between an integer and a fraction.

249. Cut from paper, or mark off on paper or on slate, a number of square inches, and fold or divide and subdivide them in as many ways as possible into $\frac{1}{2}$'s, $\frac{1}{3}$'s, $\frac{1}{4}$'s, $\frac{1}{5}$'s, etc.

250. Divide a square of paper as indicated in the diagram.

1. How many of any fractional unit in the diagram does it take to make the next larger fractional unit?

2. In writing whole numbers, how many units of an order make one of the next higher order?

3. What system is followed in dividing and subdividing the square in the diagram?

251. Show by the diagram the meaning of the following:

		Decimal Notation.
Ten Thousand		10,000.
One Thousand		1,000.
One Hundred		100.
Ten		10.
One		1.
One tenth	$\frac{1}{10}$	.1
One hundredth	$\frac{1}{100}$	.01
One thousandth	$\frac{1}{1000}$	.001
One ten-thousandth	$\frac{1}{10000}$	.0001

252. Decimal comes from *decem,* the Latin word for ten, and it is applied to the system of whole numbers and fractions in which *ten* units of one order make one of the next higher.

253. Decimal fractions are fractions in which the denominators are 10, 100, 1000, etc. (1 with ciphers annexed).

254. The denominators of decimal fractions are not usually expressed, but are indicated by the number of places at the right of the decimal point, there being one place for every cipher in the denominator. Thus,

$\frac{1}{10}$	is written	.1	$\frac{1}{100}$	is written	.01	$\frac{1}{1000}$	is written	.001
$\frac{2}{10}$	"	.2	$\frac{2}{100}$	"	.02	$\frac{9}{1000}$	"	.009
$\frac{3}{10}$	"	.3	$\frac{3}{100}$	"	.03	$\frac{23}{1000}$	"	.023
$\frac{7}{10}$	"	.7	$\frac{17}{100}$	"	.17	$\frac{97}{1000}$	"	.097
$\frac{9}{10}$	"	.9	$\frac{59}{100}$	"	.59	$\frac{769}{1000}$	"	.769

255. To write any decimal fraction, write the numerator the same as any whole number, and place a decimal point at the left making as many decimal places, however, as there are ciphers in the denominator.

If the numerator does not occupy all the places, ciphers are placed between it and the decimal point.

256. Express in decimal notation the following fractions:

1. $\frac{5}{10}$.	*4.* $\frac{9}{100}$.	*7.* $\frac{7}{10}$.	*10.* $\frac{17}{1000}$.	*13.* $\frac{3}{1000}$.
2. $\frac{8}{10}$.	*5.* $\frac{19}{100}$.	*8.* $\frac{7}{100}$.	*11.* $\frac{97}{1000}$.	*14.* $\frac{303}{1000}$.
3. $\frac{5}{100}$.	*6.* $\frac{25}{100}$.	*9.* $\frac{47}{100}$.	*12.* $\frac{107}{1000}$.	*15.* $\frac{93}{1000}$.

257. Read the following:

1. .5	*4.* .09	*7.* .63	*10.* .105	*13.* .0105
2. .8	*5.* .29	*8.* .063	*11.* .738	*14.* .0909
3. .05	*6.* .59	*9.* .007	*12.* .909	*15.* .1075

Thus, 9 : Seven *thousandths;* 13 : One hundred five *ten-thousandths.*

258. Whole numbers and decimal fractions may be written and read together as in the following:

Table.

Orders or Places.	Millions.	Hundred thousands.	Ten thousands.	Thousands.	Hundreds.	Tens.	Units.	**Decimal Point.**	Tenths.	Hundredths.	Thousandths.	Ten-thousandths.	Hundred-thousandths.	Millionths.
Numbers to be read.	5 ,	4	9	0 ,	7	0	8	.	2	0	3 ,	7	4	2
		2	1	4 ,	2	0	6	.	0	0	7	0	6	
			3	9 ,	0	9	0	.	0	4	0	8		
	1 ,	0	0	0 ,	1	0	1	.	1	0	0	0	1	

259. Read above numbers, explaining the value of each place.

260. Read each number, as if it consisted of two whole numbers separated by a decimal point standing for *and.* The part of the number at the right of the decimal point being only a numerator, is followed by the name of its lowest order, which is the name of the denominator.

Thus: Five million four hundred ninety thousand seven hundred eight *and* two hundred three thousand seven hundred forty-two *millionths.*

261. Write the following numbers from dictation:

1. One thousand fifty-five *and* twenty-three *thousandths.*
2. Four hundred seven *and* one hundred five *thousandths.*
3. Ten thousand six *and* one hundred six *ten-thousandths.*
4. Eighty *and* eighty-five *ten-thousandths.*
5. Five *and* five *hundred-thousandths.*
6. Seventy *and* seven *ten-thousandths.*
7. Forty *and* forty-four *thousandths.*
8. Six hundred six *and* three hundred three *ten-thousandths.*
9. One thousand seven hundred *and* five hundred one *thousandths.*
10. Nine hundred ninety *and* nine hundred nine *millionths.*

262. Reduction. I. **To change a common fraction to a decimal fraction.**

1. Reduce or change $\frac{1}{2}$ to a decimal fraction.

   $\frac{1}{2}$ stands for 1 divided by 2; 1 equals 1.0. 2)1.0 .5 Ans.

2. Reduce $\frac{1}{4}$ to a decimal fraction.

   $\frac{1}{4}$ stands for 1 divided by 4; 1 equals 1.00. 4)1.00 .25 Ans.

3. Reduce $\frac{3}{4}$ to a decimal fraction.

   $\frac{3}{4}$ stands for 3 divided by 4; 3 equals 3.00. 4)3.00 .75 Ans.

4. Reduce $\frac{3}{8}$ to a decimal fraction. 8)3.000 .375 Ans.

263. To reduce a common fraction to a decimal fraction divide the numerator by the denominator. Write a decimal point and as many ciphers after the numerator as are required to give a quotient, if possible, without remainder.

Each cipher annexed at the right of a decimal fraction multiplies the numerator and denominator both by 10, and thus does not change the value of the decimal fraction.

264. United States Money is a decimal currency to which the rules for decimals are applied.

265. Copy, and commit to memory the following table:

UNITED STATES MONEY.

10 MILLS (m.) . . .	make . .	1 CENT, ¢, or ct.
10 CENTS (¢, cts.) . .	" . . .	1 DIME.
10 DIMES	" . . .	1 DOLLAR, $.

266. Reduce to decimal fractions:

1. $\$\frac{1}{4}$.	*4.* $\$\frac{4}{5}$.	*7.* $\$\frac{7}{8}$.	*10.* $\$\frac{7}{20}$.	*13.* $\$\frac{1}{25}$.
2. $\$\frac{3}{4}$.	*5.* $\$\frac{1}{8}$.	*8.* $\$\frac{1}{20}$.	*11.* $\$\frac{11}{20}$.	*14.* $\$\frac{2}{25}$.
3. $\$\frac{2}{5}$.	*6.* $\$\frac{3}{8}$.	*9.* $\$\frac{3}{20}$.	*12.* $\$\frac{13}{20}$.	*15.* $\$\frac{4}{25}$.

One-tenth of a dollar is a *dime;* one-hundredth, a *cent;* one-thousandth, a *mill.* Mills are used only in large business calculations.

267. Reduction. II. **To change a decimal fraction to a common fraction.**

1. Reduce .4 to a common fraction.

.4 may be written $\frac{4}{10}$, which in its lowest terms is $\frac{2}{5}$.

2. Reduce .25 to a common fraction.

.25 may be written $\frac{25}{100}$, which in its lowest terms is $\frac{1}{4}$.

3. Reduce .125 to a common fraction.

.125 may be written $\frac{125}{1000}$, which in its lowest terms is $\frac{1}{8}$.

4. Reduce .032 to a common fraction.

268. To reduce a decimal fraction to a common fraction, express the decimal fraction as a common fraction and reduce it to its lowest terms.

269. Reduce to common fractions:

1. $ .5.	*4.* $.20.	*7.* $.125.	*10.* .72.	*13.* .45.
2. $.25.	*5.* $.30.	*8.* $.375.	*11.* .75.	*14.* .015.
3. $.75.	*6.* $.80.	*9.* $.625.	*12.* .08.	*15.* .008.

270. Copy, and commit to memory:

\$1.00 equals \$1.	\$.20 equals \$$\frac{1}{5}$.	\$.125 equals \$$\frac{1}{8}$.
\$ .50 " \$$\frac{1}{2}$.	\$.40 " \$$\frac{2}{5}$.	\$.375 " \$$\frac{3}{8}$.
\$ .25 " \$$\frac{1}{4}$.	\$.60 " \$$\frac{3}{5}$.	\$.625 " \$$\frac{5}{8}$.
\$ .75 " \$$\frac{3}{4}$.	\$.80 " \$$\frac{4}{5}$.	\$.875 " \$$\frac{7}{8}$.

\$.08$\frac{1}{3}$ equals \$$\frac{1}{12}$; \$.16$\frac{2}{3}$ equals \$$\frac{1}{6}$.

271. Reduction. III. **To change from one decimal to another equal decimal.**

100 = 1 hundred,	**10** = 1 ten,
= 10 tens,	= 10 units,
= 100 units,	= 100 tenths, 10.0
= 1000 tenths, 100.0	= 1000 hundredths, 10.00.

1 = 1 unit,	**.1** = 1 tenth,
= 10 tenths, 1.0	= 10 hundredths, .10
= 100 hundredths, 1.00	= 100 thousandths, .100
= 1000 thousandths, 1.000	=1000 ten-thou., .1000

.01 = 1 hundredth,
= 10 thousandths, .010
= 100 ten-thousandths, .0100
= 1000 hundred-thousandths, .01000

272. To reduce to the next lower denomination, move the decimal point one place to the right; to reduce to the next higher denomination, move the decimal point one place to the left.

273. Reduce the following sums of money:

to dimes.	to cents.	to mills.	to cents.	to dollars.
1. \$ 5.00.	*4.* \$ 3.00.	*7.* \$ 4.	*10.* \$5.025.	*13.* 4050 m.
2. \$25.00.	*5.* \$12.50.	*8.* \$12.	*11.* \$1.375.	*14.* 3675 ¢.
3. \$ 2.50.	*6.* \$ 7.90.	*9.* \$ 8.	*12.* \$4.024.	*15.* 2780 d.

ADDITION AND SUBTRACTION.

274. Decimals are added and subtracted as whole numbers are added and subtracted.

Units of the same order are written in the same column. By writing the decimal points in one column, the units of the same order are more readily placed in their proper columns.

275. Find the sums:

1.	2.	3.	4.	5.
$100.05	$48.955	$125.20	$72.07	$1.008
25.60	3.068	70.06	1.005	.49
86.04	17.102	8.125	100.	20.07
230.30	20.257	10.015	50.50	6.005

6.	7.	8.	9.	10.
10.1	4.5	.005	.0009	38.0308
1.01	.02	5.05	.29	7.071
12.012	2.9	.5	9.	40.4
7.004	20.	50.	.9	5.015

Read thousandths of a dollar as mills. Thus: Forty-eight dollars *and* ninety-five cents, 5 mills; 5 mills are frequently read as half a cent. Thus: Ninety-five and a half cents.

276. Find the remainders:

1.	2.	3.	4.	5.
$200.005	$47.07	$70.708	$45.40	$20.205
68.909	39.689	69.819	8.008	19.207

6.	7.	8.	9.	10.
8.8008	100.01	76.054	27.6	1.01
5.09	58.007	8.0009	5.0408	.101

11.	12.	13.	14.	15.
90.09	500.00	12.505	2.02	10.01
69.069	.05	9.09	.6057	.101

277. Oral Problems. 1. What is the sum of 1., .5, and .07? Of 3., .2, and .05?

2. Mr. Thomson bought 5. acres, 2.5 acres, and .2 acres of land. How much did he have left after selling 7 acres?

3. Edward earned $5.75 and spent $3¼ each week. How much did he save in a week?

4. Thomas worked 3.5 hours and then found it was 5 o'clock. At what hour did he begin his work?

5. Mr. Small bought cloth for $⅜ per yard and sold it so as to make $.125 per yard. At what price did he sell the cloth?

6. What is the selling price of peaches bought for $⅝ per basket and sold at a loss of $.125 per basket?

7. Mr. Bell bought wheat for $⅞ per bushel and sold it for $1 per bushel. How much did he gain?

278. Written Problems. 1. Mr. Andrews bought groceries, $17.55; clothing, $38.25; and books, $15.90. How much did he have left from $100 after paying the bills?

2. A farmer paid $875 for his farm, $112.50 for a horse, $17.75 for a cow, and $8.25 for feed. How much more than $1,000 did he pay for all?

3. Mr. Brown earned $55 per week and spent $16.67 for rent, $17.25 for groceries, and $8.05 for meat, $5.22 for fuel, and $3.75 for clothes. How much money did he have left?

4. From the sum of five and five thousandths; three and three hundredths; and twenty and twenty-five ten-thousandths, take the difference between ninety and nine-tenths; and eighty-seven and seven thousandths. What is the remainder?

5. A grocer's receipts for a week were: $750, $825.37, $600.50, $597.37, $681., and $729.30. His expenses were: $64., $125.75, $180.93, $1,000., $426.50, and $2,230.80. How much money did he have left at the end of the week?

MULTIPLICATION.

279. To multiply when the multiplier is a whole number.

1. Find the product of 45.025 by 17.

```
 45.025
     17
 ------
 315175
 45025
 ------
 765.425
```

Explanation.—1. Multiply first as if there were no decimal point.

2. Multiplying 45,025 thousandths by 17 gives a product of 765,425 thousandths.

3. To indicate thousandths, the order of the answer, point off three decimal places in the product.

2.	3.	4.	5.	6.
$28.065	$408.52	$59.006	$60.865	$7.075
9	12	11	.8	.9

7.	8.	9.	10.	11.
9.0684	1.1056	40.0609	50.507	5.0557
26	104	275	362	123

280. To multiply a decimal fraction by a whole number multiply as with integers, and then point off in the product as many decimal places as there are in the multiplicand.

281. To multiply any number by 10, 100, 1000, etc.

1. Find the product of .006 multiplied by 10.

$$.006 = \frac{6}{1000}$$
$$10 = 10$$
$$.060 = \frac{60}{1000} = \frac{6}{100}.$$

Explanation.—1. Multiplying 6 thousandths by 10 gives 60 thousandths, written, .060.

2. .060 reduced by removing the cipher at its right equals .06, Answer.

Or, merely move the decimal point one place to the right.

2. Find the product of .006 multiplied by 100.

$$.006 = \frac{6}{1000}$$
$$100 = 100$$
$$.600 = \frac{600}{1000}$$

Explanation.—1. 6 thousandths multiplied by 100 is 600 thousandths, or .600.

2. .600, reduced by removing the ciphers at the right, is 6 tenths, or .6, Answer.

Or, merely move the decimal point two places to the right.

282. To multiply by 10, 100, etc., move the decimal point as many places to the right as there are ciphers in the multiplier, annexing ciphers when necessary.

283. Find the products in the following:

1. **10** ×	*2.* **10** ×	*3.* **100** ×	*4.* **100** ×	*5.* **1000** ×
$.006	.01	$.125	.0001	.5
$.06	.005	$1.05	.009	.05
$.6	2.5	$55.009	.9	12.63
6.60	12.05	$.65	7.07	1.007
6.	7.7	$7.007	.005	5.0605

284. To multiply when the multiplier is a decimal.

1. Find the product of $.25 multiplied by .3.

$$.25 = \frac{25}{100}$$
$$.3 = \frac{3}{10}$$
$$.075 = \frac{75}{1000}$$

Explanation.—1. Multiplying as with whole numbers, the product is 75. This product is the product of the two numerators.

2. As the denominators of the multiplicand and multiplier are hundredths and tenths, the denominator of the answer is thousandths. As 2 decimal places indicate hundredths and 1 decimal place, tenths, 3 decimal places (the sum of 2 and 1) represent thousandths, the denominator of the answer.

2.	**3.**	**4.**	**5.**	**6.**
$.016	$2.036	$25.06	$30.005	$100.50
.12	.11	.0012	.008	1.2

7.	**8.**	**9.**	**10.**	**11.**
8.6	9.005	270.3	45.02	.1805
.54	3.26	209.	.648	.287

285. To multiply by a decimal, multiply as in whole numbers and point off in the product as many decimal places as there are in the multiplicand and the multiplier together.

286. Find the products in the following:

1. **2.3** ×	*2.* **.45** ×	*3.* **.068** ×	*4.* **2.05** ×	*5.* **1.0008** ×
47.5	3.6	1.059	6.503	43.008
6.08	27.02	.087	.041	7.8002
1.052	8.089	40.5	88.1	10.001
3.025	10.24	3.07	7.07	4.0004
18.5	3.075	.808	.049	45.807

287. Oral Problems. 1. How far can Matthew run in 10 hours, if he runs 7.5 miles each hour?

2. What is the cost of 100 blank books, if one costs $.05? $.075?

3. What does pine timber cost per 1,000 feet, if it costs $.025 per foot?

4. If a load of hay is worth $1.12, what is .5 of the load worth?

5. John owned .3 of a sail boat. He sold .5 of his share. What part of the boat did he sell?

6. If 2.5 yards of cloth are required for each vest, how many yards are required for 3 vests?

7. If one acre of land produces 2.5 bushels of corn, how much will .7 of an acre produce?

8. What is the value of 100 cords of wood at $3.37½ a cord?

9. At $2.25 a pair, what will 20 pairs of shoes cost?

10. How much will 50 hats cost, at $2.50 each?

11. What number divided by .12 will give .3?

288. Written Problems. 1. How much will 86.043 tons of coal cost at $4.23 a ton?

2. What is the cost of 2¾ bales of cotton, each bale containing 127.037 pounds at $.12½ a pound?

3. If one foot of wire fence costs $1.12½, how much will 424 feet cost?

4. If one acre of land produces 93.095 bushels of potatoes, how many bushels will 3.475 acres produce ?

5. What cost 132 pounds of sugar at $6\frac{1}{4}$ cents a pound ?

6. At 1.12\frac{1}{2}$, what is the cost of 944 steel shovels ?

7. If a house and lot are worth $7,650, what is .1875 of their value ?

DIVISION.

289. To divide when the divisor is a whole number.

1. Find the quotient of .3 divided by 8.

$$8).3\overset{6}{0}\overset{4}{0}00$$
$$.0375$$

Explanation.—1. Write the numbers and divide as in whole numbers, annexing at the right of the dividend as many ciphers as are required to give a quotient without remainder.

2. As 3 tenths do not contain the divisor place a cipher under it in the quotient.

3. 3 tenths equal 30 hundredths, which divided by 8 gives 3 hundredths with 6 hundredths remainder. Write 3 under the hundredths.

4. The 6 hundredths remainder equal 60 thousandths which divided by 8 gives 7 thousandths with 4 thousandths remainder. Write 7 under the thousandths.

5. The 4 thousandths remainder equal 40 ten-thousandths which divided by 8 gives 5 ten-thousandths. Answer, 3 hundredths, 7 thousandths, and 5 ten-thousandths, or .0375.

2. Find the quotient of 10.908 divided by 12.

$$12)10.908$$
$$.909$$

Explanation.—1. Dividing as in whole numbers, the quotient is 909.

2. Point off as many places in the quotient as there are in the dividend, for the denomination of the quotient is the same as the denomination of the dividend. As the dividend is thousandths, the quotient is thousandths.

3. Find the quotient of 1.728 divided by 144.

```
      .012
144) 1.728
     1 44
       288
       288
```

Explanation.—1. Write the numbers as in long division, drawing a straight line above the dividend over which to write the quotient.

2. As the divisor is not contained in 17 tenths, write a cipher over tenths in the quotient.

3. 172 hundredths contains the divisor 1 hundredth time with a remainder of 28 hundredths. Write 1 hundredth in the quotient.

4. The 28 hundredths equal 280 thousandths which with the 8 thousandths make 288 thousandths. 288 thousandths contain the divisor 2 thousandths times. Write 2 in the quotient over the thousandths. Answer, 1 hundredth and 2 thousandths, or 12 thousandths.

4.	**5.**	**6.**	**7.**	**8.**
9).0605	7)15.064	11)1.012	12).01248	9)1.008
9.	**10.**	**11.**	**12.**	**13.**
24).081	19)14.25	82)295.2	127).9171	48)1.59

Extend the answers to four decimal places.

290. To divide when the divisor is a whole number, divide as with whole numbers and point off as many places in the quotient as there are in the dividend.

Ciphers may be annexed after the decimal point in the dividend, so that the dividend will contain the divisor, or so that it may give a quotient without a remainder.

291. Find the quotients in the following:

1. **18** in	*2.* **25** in	*3.* **42** in	*4.* **105** in	*5.* **204** in
7.02	4.0075	.5712	30.45	3.468
.099	.015	44.94	9.135	6.1
50.4	30.25	21.136	21.315	11.424
8.1	2.5	1.176	1.0395	17.34
12.05	3.06	27.004	40.5	1.125

292. To divide when the divisor is 10, 100, 1000, etc.

1. Find the quotient of .006 divided by 10.

10).006
.0006

Explanation.—Dividing by 10 gives for answer .0006, in which the decimal point is one place further to the left.

2. Find the quotient of .006 divided by 100.

100).006
.00006

Explanation.—Dividing by 100 gives .00006 for the quotient, in which the decimal place is two places further to the left.

293. To divide by 10, 100, etc., move the decimal point as many places to the left as there are ciphers in the divisor.

294. Find the quotients in the following:

1. **10** in	*2.* **10** in	*3.* **100** in	*4.* **100** in	*5.* **1000** in
$2.00	$5.00	$7.00	.01	10.
$ .20	$5.50	$ .70	.303	1.
$ .02	$ .75	$8.10	1.04	.1
$2.20	$ .08	$1.00	.057	1.1
$ .22	$1.25	$ .90	.006	.075

295. To divide when the divisor is a decimal.

1. Find the quotient of .09104 divided by .08.

.08).09|104
1.138

Explanation.—1. Move the decimal point two places to the right, and then divide as if the divisor were a whole number. Removing the decimal point in the divisor and moving that in the dividend is the same as multiplying both divisor and dividend, and does not change the value of the result.

2. 8 in 9, **1** and 1 over; in 11 tenths, **1** and 3 over; in 30 hundredths, **3** and 6 over; in 64 thousandths, **8**. Answer, 1.138.

2. Find the quotient of .777 divided by 2.1.

```
     .37
2.1).7|77
     63
     ---
     147
     147
     ---
```

Explanation.—1. Move the decimal point in the divisor and in the dividend one place to the right. This is the same as multiplying them both by 10, and does not affect the result. Divide as if the divisor were a whole number.

2. 21 in 77 tenths, **3** and 14 over; in 147 hundredths, **7**. Answer, 37.

3.	**4.**	**5.**	**6.**
.0007)1.0000|00	.0011)104.5000|	.004).5304	.009)72.063
14285.6+			

7.	**8.**	**9.**	**10.**
.054)1.6308	.075)24.75	5.063)55.38922	70.8).48852

296. To divide when the divisor is a decimal, move the decimal point of the dividend as many places to the right as there are decimal places in the divisor (annexing ciphers to the dividend, if necessary, for this purpose), and then divide as by a whole number.

297. Find the quotients:

1. **1.005** in	*2.* **.075** in	*3.* **.0092** in	*4.* **2.9** in	*5.* **70.5** in
.7525	84.025	1.07	580.	.0632
.0625	6.002	.064	87.087	.005
.845	25.65	15.507	6.6	.4
.6015	13.275	.008	14.02	.1025

298. To find the cost, when the number and the price per hundred, per thousand, or per ton are given.

1. What cost 2,725 feet of pine boards at $4¼ per hundred?
   Divide 2,725 by 100 to find the number of hundred feet.

2. If 1,000 bricks cost $32, what will 5,250 bricks cost?
   Divide 5,250 by 1,000 to find how many thousands there are.

3. At $5.25 per ton, what cost 420,000 pounds of coal?
   Divide 420,000 by 2,000 to find the number of tons.

299. To find the cost when the number and price per hundred, per thousand, or per ton are given, divide the number by one hundred, one thousand, or two thousand, and multiply the quotient by the price.

300. Find the cost of the following, the prices being:

Per Hundred.

ft.	$.	lb.	$.	ft.	$.
1. 4,608 @	2.50	*5.* 3,050 @	18.50	*9.* 4,750 @	22.50
2. 1,960 @	1.75	*6.* 2,512 @	8.75	*10.* 5,025 @	17.25
3. 2,508 @	2.25	*7.* 1,084 @	10.20	*11.* 7,800 @	16.30
4. 5,010 @	2.75	*8.* 2,806 @	7.35	*12.* 9,072 @	20.00

Per Thousand.

ft.	$.	lb.	$.	ft.	$.
13. 2,706 @	$15\frac{1}{2}$	*17.* 2,807 @	30	*21.* 5,050 @	25.50
14. 1,050 @	$10\frac{1}{4}$	*18.* 6,055 @	25	*22.* 670 @	17.38
15. 860 @	$8\frac{1}{3}$	*19.* 907 @	22	*23.* 1,009 @	36.75
16. 425 @	$7\frac{3}{4}$	*20.* 643 @	17	*24.* 50 @	18.00

Per Ton.

lb.	$.	lb.	$.	lb.	$.
25. 4,000 @	5	*29.* 870 @	$3\frac{3}{4}$	*33.* 75,075 @	7.50
26. 2,800 @	4	*30.* 655 @	$4\frac{1}{4}$	*34.* 17,020 @	6.75
27. 5,260 @	6	*31.* 1,025 @	$4\frac{1}{2}$	*35.* 50 @	4.50
28. 948 @	5	*32.* 28,030 @	$5\frac{3}{4}$	*36.* 10,025 @	5.35

301. Written Problems. 1. What is the cost of 675 pounds of cheese at $8 per hundred?

2. How much is paid for 16,225 pounds of freight between New York and San Francisco at 3.37\frac{1}{2}$ a hundred?

3. If anthracite coal is sold at $5.75 per ton, what would be the selling price for 275,630 pounds of it?

4. A dealer bought 360,000 feet of lumber at 12\frac{3}{4}$ per thousand. What was the cost price?

5. If 360,000 feet of lumber are sold at 2\frac{1}{4}$ per hundred, what is the selling price?

302. Oral Problems. 1. What is the cost of one box of strawberries, if 100 boxes cost $7.50 ?

2. If 1,000 acres of land sell for $7,500, what does one acre sell for ?

3. What number multiplied by 5 will give 50 ? .5 ? .05 ?

4. What number multiplied by .2 gives .4 ? .04 ? .004 ?

5. James earns $.75 a day. How long will it take him to earn $7.50 ?

6. What will be the cost of one pound of beef, if $12.50 is the cost of 100 pounds ?

303. Written Problems. 1. If .4 of a house and lot is worth $3,575, what is their entire value ?

2. What is the value of an acre of land of which .125 of an acre is worth $100 ?

3. If the dividend is 7616.25 and the quotient 4.062, what is the divisor ?

4. If the entire cost of sustaining the schools of a city for one year is $1,334,855.04, and the cost per pupil is $19.065, how many pupils are there in the schools ?

5. How many books at $.345 each were there in a stock valued at $692.07 ?

6. What was the cost per ton, if 250,640 pounds of coal were bought for $469.95 ?

7. What is paid for each pair of shoes, if $39,441.12 is paid for the shoes of an army containing 9,705 men ?

MISCELLANEOUS PROBLEMS.

304. Oral Problems. 1. Mary had $1.00 and spent $$\frac{1}{4}$$. How much money did she then have ?

2. How many yards of gingham at $1.25 can be bought for $1 ? For $5 ? For $7 ? For $7.50 ?

3. Mr. James bought 4 chairs at $1.15 each. He paid for them with a $5 bill. How much change was due him ?

4. A merchant bought silk at $1\frac{3}{8}$ a yard and sold it for $1.50 a yard. How much did he gain on each yard ?

5. If 5 blank books are sold at $.25 each, and are paid for with $1.50, how much change should be given ?

6. How many dozen buttons at 10 cents a dozen are equal in value to 5 pounds of butter at $.15 a pound ?

7. What number multiplied by .2 equals .6 ? .06 ?

8. At $.02 each, how many eggs can be bought for $2 ?

9. What will 10 yards of muslin cost at $.125 a yard ?

305. Written Problems. 1. A mass of metal weighed 435.0625 tons. It contained 100.025 tons of iron ; 75.0405 tons of copper, and 55.063 tons of tin. The remainder was lead. What was the weight of the lead ?

2. A man purchased .375 of a ship worth $1,500,000. He sold his share for $650,000. Did he gain or lose, and how much ?

3. A farm containing 1,250.0125 acres of land was sold for $250 an acre. For how much was the farm sold ?

4. A farm containing 1,250.0125 acres was sold for $218,-752.20. How much was this an acre ? What was the gain or loss per acre, if the farm cost $200 an acre ?

5. A contractor had $1,200 with which to pay for the labor of 500 men for 12 hours at $.16$\frac{2}{3}$ an hour. How much money did he have left ?

6. Mr. Jones received a check for $2,000 in payment for 1,724 bushels of wheat at 1.12\frac{1}{2}$ a bushel. How much money should he return to the purchaser ?

7. How many bushels of wheat can be bought for $7,-437.50, if each bushel costs $.875 ?

8. What is the cost of a load of hay weighing 2,250 pounds at $14 a ton ?

9. If a wagon loaded with hay weighs 2,500 pounds, and the wagon weighs 600, what is the hay worth at $12 a ton ?

10. A coal dealer receives five loads of coal weighing as follows: 2,405.5 pounds, 1,985.25 pounds, 2,025.75 pounds, 2,100 pounds, and 2,269.125 pounds. How much does the coal cost him at $4.375 a ton?

11. A farmer exchanges 45 pounds of butter at $.225 a pound and 10 dozen of eggs at $.18 a dozen for cloth at $.375 a yard. How many yards of cloth should he receive?

12. In how many working days can a laborer save $100, if his wages are $2.25 a day and his expenses $1.75 a day?

13. How many barrels of flour at $5.25 a barrel are equal in value to 1,000 tubs of butter each containing 60 pounds at $.189 per pound?

14. If 15 men earn $22.50 in one day, how much can 1,000 men earn at the same rate?

15. How long will it take 10 men to earn $687.50, if they can earn each $1.375 a day?

16. Mr. Benson bought 96.875 acres of land for $135.50 per acre. Did he gain or lose by selling the farm for $15,000, and how much?

17. If 3,750 tons of coal cost $15,975, how much will 10.25 tons cost?

18. How many tons of hay can be bought for $234.375, if 25.25 tons are bought for $315.625?

19. Mr. Blake owes $145.25. How long will it take him to save that amount, if he receives $75 per week and spends $62.36 per week?

20. If Mr. Cohn buys lace for $$\frac{5}{8}$$ per yard and sells it for $.75 per yard, how many yards must he sell to gain $50.00?

21. If a merchant buys carpet for $$1\frac{3}{8}$$ per yard, at what price must he sell it to gain $25 on a hundred yards?

22. Mr. Baker bought apples at $2.50 a barrel, and sold them so that he lost $750 on a thousand barrels. What was the selling price per barrel?

PERCENTAGE.

306. 1. Mr. James had $100 and spent $50. What part of his money did he spend?

2. Frank earned $100 a month and paid $25 for board. What part of his money did he pay for board?

3. Mr. Johnson bought a wagon for $100 and sold it so as to make $10. His profit, or what he made, was what part of the cost price?

4. Mr. Edson saves $100 in 100 days, saving one dollar each day. What part of the money does he save in one day?

5. $1 is what part of $100? 1 is how many hundredths or *per cent.* (%) of 100?

6. $2 is how many hundredths of $100? 2 is how many *per cent.* (%) of 100?

7. $3 is how many hundredths of $100? 3 is how many *per cent.* (%) of 100?

8. $7 is how many hundredths of $100? 7 is how many *per cent.* (%) of 100?

9. What *per cent.* of $100 is $20? What *per cent.* is $25? $50?

307. Per cent. comes from the Latin phrase, *per centum, by the hundred,* and means so many hundredths.

Thus, 2 per cent. of a number means 2 hundredths, or .02 of the number; 5 % = .05; 7 % = .07; 25 % = .25.

308. The number of hundredths is called the **rate per cent.**

Thus, in .02, .05, .07, and .25 the *rate per cent.* is 2, 5, 7, and 25.

309. The result obtained by taking so many hundredths or per cent. of a number is called the **percentage.**

Thus, in .05 (5 %) of 1,800 = 90, the *percentage* taken is 90.

310. Oral Problems. 1. Mr. Sparks bought a horse for $100 and sold it so as to gain 5 %. How much did he gain?

2. How much would be made by buying a wagon for $100 and selling it so as to make 6 %? 7 %? 8 %? 9 %? 10 %?

3. Mr. Barnes, the real estate broker, sold a city lot for $500. How much should he receive for his services, if his charge was 1 %? 2 %? 3 %? 4 %? 5 %?

4. How much did Mr. Carson lose by buying $800 worth of flour and selling it at a loss of 2 %? 3 %? 4 %? 5 %? 10 %?

311. To find a percentage of a number multiply the given number by the number of hundredths in the rate per cent. Thus, 7 % of $35 = .07 of $35.

$35
.07
$2.45 Ans.

312. Find the following percentages:

1. **1 %** of	*2.* **2 %** of	*3.* **5 %** of	*4.* **6 %** of	*5.* **9 %** of
$550	$39	$75	$25.50	$1,860
$55	$605	$7	$47.50	$795
$5	$28	$250	$9.50	$410
$478	$125	$83	$12.50	$835

6. **10 %** of	*7.* **12 %** of	*8.* **20 %** of	*9.* **25 %** of	*10.* **50 %** of
$140.80	$1,000	$50.75	$8,000	$1,200
$85.20	$775	$30.50	$6,400	$2,800
$173.60	$918	$15.25	$5,600	$3,640
$29.30	$1,512	$20.00	$4,000	$4,840

313. Copy, and commit to memory:

100 % = 1.00 = 1.	20 % = .20 = $\frac{1}{5}$.	$33\frac{1}{3}$ % = .$33\frac{1}{3}$ = $\frac{1}{3}$.
50 % = .50 = $\frac{1}{2}$.	10 % = .10 = $\frac{1}{10}$.	$16\frac{2}{3}$ % = .$16\frac{2}{3}$ = $\frac{1}{6}$.
25 % = .25 = $\frac{1}{4}$.	5 % = .05 = $\frac{1}{20}$.	$12\frac{1}{2}$ % = .$12\frac{1}{2}$ = $\frac{1}{8}$.

$37\frac{1}{2}$ % = $\frac{3}{8}$; $62\frac{1}{2}$ % = $\frac{5}{8}$; $87\frac{1}{2}$ % = $\frac{7}{8}$.

Many problems are worked more readily by using the fractional parts rather than the %'s.

314. Oral Problems. PROFIT AND LOSS. 1. Edgar bought a sled for $2.40 and sold it at a loss of 25 %. How much did he lose?

2. Mr. Brown bought his house for $6,000 and sold it so as to gain $33\frac{1}{3}$ %. What was his gain?

3. A grocer bought sugar for 8 cents a pound and sold it at a gain of $12\frac{1}{2}$ %. What was his selling price?

4. If a merchant buys cloth at 60 cents a yard, and sells it at a loss of $16\frac{2}{3}$ %, what is the selling price?

5. Mr. Robins earned $1,800 a year. He paid $33\frac{1}{3}$ % of his salary for rent. How much did he have left?

6. What is the selling price of a city lot bought for $400 and sold at a gain or profit of 20 %?

7. At what price shall goods costing 12 cents a pound be sold to make $8\frac{1}{3}$ %?

COMMISSION, INSURANCE, ETC. 8. A real estate agent sold a farm for $2,000 and charged for his services 5 % commission. How much was his commission?

9. Mr. Martin insured his house for $10,000 at 1 % per year. What premium, or amount of money did he pay?

10. What is the premium for insuring furniture valued at $400 for $\frac{1}{2}$ % a year?

11. Sarah received 60 % for correct answers in working 10 examples in arithmetic. How many of her answers were right?

60 % equals $\frac{3}{5}$.

315. Written Problems. PROFIT AND LOSS. 1. At what price shall a house costing $6,525 be sold to gain 40 %?

2. How much does a flour merchant lose by selling 500 barrels of flour costing $4.25 a barrel at a loss of $22\frac{1}{2}$ %?

3. If a load of potatoes cost $25, and the carting $2.50, how much must be charged for the load so as to gain $12\frac{1}{2}$ %?

4. Mr. Johnson bought a horse for $175 and sold it at a profit of 15 %. What was the selling price?

5. Mr. James bought 1,500 tons of coal at \$3.75 a ton, and sold it so as to gain 30 %. What was his profit?

6. Mr. Mason bought a farm for \$6,050. He paid at different times 25 %, 32 %, and 22 %. What did he still owe?

The cost equals 1.00, or 100 %.

COMMISSION, INSURANCE, ETC. 7. A ship was insured for $\frac{4}{5}$ of \$50,000 at $1\frac{1}{4}$ %. What was the premium?

8. A commission merchant sold 25,000 bushels of wheat at \$.$87\frac{1}{2}$ a bushel, and charged $1\frac{3}{4}$ % for his services. How much was his commission?

9. Mr. Franklin invested \$60,000 in business through a broker, who charged him $\frac{3}{4}$ % commission. How much did he pay the broker?

10. A broker charged $\frac{1}{8}$ % commission for selling 500 shares of stock at \$100 each. What was his commission?

11. What is the annual premium for insuring a house for \$12,500 at $2\frac{1}{4}$ %.

12. If a tax is 9 mills on the dollar, what is the amount of tax on \$45,000?

9 mills equal .9 of 1 %, or .009 of the whole.

316. To find a number when a part of it and the rate are given.

1. Mr. Barker sold cloth so as to gain on each yard 10 cents, or $12\frac{1}{2}$ % of the cost. What did the cloth cost?

If 10 c. was $\frac{1}{8}$ ($12\frac{1}{2}$ %) of the cost, $\frac{8}{8}$, or the cost, was 8 times 10 c., or \$.80.

2. Mr. Hall sold a house so as to gain, \$2,000, which was 25 % of the cost. What was the cost?

If \$2,000 was $\frac{1}{4}$ (25 %) of the cost, $\frac{4}{4}$, or the cost, was 4 × \$2,000.

3. Mrs. Shaw's rent was \$420, which was 7 % of the value of the house. What was the value?

$$\frac{\$\cancel{420}^{60} \times 100}{\cancel{7}} = \$6,000 \text{ Ans.}$$

Divide by 7 to find 1 %; multiply by 100 to find 100 %, or the value.

317. To find a number when a part of it and the rate are given, divide the part by the rate, and multiply by one hundred.

The answer is often more readily found by working as in common fractions.

318. Find the number of which

1. **10 %** is	*2.* **12½ %** is	*3.* **20 %** is	*4.* **25 %** is	*5.* **50 %** is
$500	$100	$1.50	$2.00	$10.00
$450	$250	$2.25	$5.00	$8.50
$150	$225	$4.00	$5.50	$12.50
$125	$160	$5.00	$8.25	$9.00

6. **4 %** is	*7.* **5 %** is	*8.* **6 %** is	*9.* **7 %** is	*10.* **24 %** is
$100	$2.50	$ .60	$ .70	$4.80
$80	$1.00	$ .96	$7.00	$ .96
$75	$ .50	$6.00	$7.70	$7.20
$125	$ .75	$4.20	$8.40	$ .48

319. Oral Problems. PROFIT AND LOSS. 1. Mr. Green sold his house and lot so as to gain $2,000, which was 10 % of its cost. What did the house cost him? What was the selling price?

2. A merchant sold lace so as to make 25 cents profit on each yard, and this was 33⅓ % of the cost price. What was the cost price? What was the selling price?

3. What is the cost of ribbon sold at a loss of 10 cents a yard, which is 16⅔ % of the cost?

4. James sells his bicycle at a loss of $15, which is 20 % of the cost price. What did the bicycle cost him? What was his selling price?

5. A grocer sold sugar at a profit of 12½ %, and thus gained 1 cent per pound. How much did the sugar cost him? What was his selling price?

Profit and loss are always a per cent. of the *cost*.

COMMISSION, INSURANCE, ETC. 6. A real estate broker charged $250 for selling property on 5 % commission. For how much did he sell the property?

Divide by the rate per cent. to find 1 %; multiply by 100 to find 100 %, or the selling price.

7. Mr. Haines sells wheat on 4 % commission, and thereby earns $400. For what sum did he sell the wheat?

8. Mr. Thomas paid $600 premium for insuring his property at 2 %. What was the amount of his insurance?

320. Written Problems. PROFIT AND LOSS. 1. Mr. Matthews sold coal at a loss of 27 % or of $540 per cargo. What did the cargo cost him? What was his selling price?

2. A grain dealer sells wheat so as to gain $1,200 or $4\frac{1}{2}$ %. What did the wheat cost him? What was his selling price?

3. A ship was sold at a profit of $15,000 or $2\frac{1}{2}$ %. What did the ship cost? What was the selling price?

4. A carpet merchant made a profit of 18 %, or $1.08 on each yard of carpet. What did the carpet cost him?

5. Benjamin sold his papers at a profit of $\frac{3}{4}$ of a cent, which was $33\frac{1}{3}$ % of the cost. What did the papers cost him? What was the selling price?

6. Mr. Richards sold his house at a gain of $1,500, or $16\frac{2}{3}$ % of the cost. What was the cost? What was the selling price?

COMMISSION, INSURANCE, ETC. 7. Mr. Jackson received $550 for his services in selling property on $1\frac{1}{2}$ % commission. What was the amount of his sales?

8. The annual premium for insuring a house at $\frac{2}{3}$ % was $250. What was the amount of the insurance?

9. Mr. Brooks insured his house at $\frac{4}{5}$ %. His annual premium was $80. What was the amount of his insurance?

10. If a broker receives $120, or $\frac{1}{8}$ % commission for his sales, what is the amount of his sales?

321. To find what per cent. one number is of another.

1. Mary's age was 4 years and Charles' age was 8 years. Mary's age was what per cent. of Charles' age?

1 year is $\frac{1}{8}$ of 8 years; 4 years are $\frac{4}{8}$ of 8 years; $\frac{4}{8} = \frac{1}{2} = .50 = 50\ \%$.

2. Mr. Barnes bought cloth at \$.20 and sold it at \$.25 a yard. What per cent. did he make?

He made \$.05 per yard; 5 cents $= \frac{5}{20}$ or $\frac{1}{4}$ or .25 or 25 %, of \$.20, the cost price.

3. If cloth is bought for \$.50 and sold for \$.40, what per cent. of the cost price is lost?

Loss $=$ \$.10 $= \frac{10}{50} = \frac{1}{5} = .20$ or 20 % of \$.50, the cost price.

4. A house was bought for \$5,000 and sold for \$6,000. What per cent. was gained?

Per cent. of profit and loss is always reckoned on the cost.

322. To find what per cent. one number is of another divide the first by the second and reduce the quotient to hundredths.

323. Find what per cent.

\$.18 is	**\$.25** is	**24** is	**8** is	**\$.75** is
1. of \$.20	*5.* of \$.50	*9.* of 48	*13.* of 10	*17.* of \$ .75
2. " \$.24	*6.* " \$.75	*10.* " 72	*14.* " 12	*18.* " \$1.50
3. " \$.32	*7.* " \$.40	*11.* " 32	*15.* " 16	*19.* " \$1.00
4. " \$.36	*8.* " \$.30	*12.* " 25	*16.* " 20	*20.* " \$ .25

MISCELLANEOUS PROBLEMS.

324. Oral Problems. 1. Mr. Carson bought flour for \$5.00 and sold it for \$5.50 per barrel. What per cent. profit did he make?

His profit was \$.50 which was $\frac{1}{10}$ or 10 % of the cost.

2. If coal is bought for \$4.00 and sold for \$3.50 per ton, what is the per cent. of loss?

3. What must cloth costing \$.50 a yard be marked, so as to gain 20 %? To lose 20 %?

4. Mr. Hewes received $75 for selling wheat on 5 % commission. What was the amount of his sales?

5. If Mr. Shaw pays 75 % on his house that cost $4,000, how much has he yet to pay?

6. A grocer bought coffee for 25 cents and sold it for 30 cents a pound. What per cent. of profit did he make?

7. Henry sells his skates at a loss of $.25 which was 25 % of the cost. How much did the skates cost him?

325. Written Problems. 1. A farmer bought a farm for $6,000 and sold it for $7,500. What per cent. did he gain? For what per cent. did he sell the farm?

2. A cargo of fruit was sold so as to gain $500, or 22½ %. What was the cost price? What was the selling price?

3. Mr. Emerson sold ¾ of 3,640 bushels of wheat at $.75 a bushel and charged 2½ % for his services. How much commission did he receive?

4. If the annual premium for insuring a quantity of furniture at 3 % is $249, what is the amount of the insurance?

5. Mr. Jarman bought a horse for $225 and sold it for $175. What was his per cent. of loss?

6. A real estate broker received $750 for selling property at 1¾ % commission. What was the amount of his sale?

7. If cloth is bought for $2.40 a yard and sold for $2.80 a yard, what is the per cent. of profit?

8. If calico is bought for $.08⅓ and sold for $.06⅔ per yard, what is the per cent. of loss?

9. By selling a house and lot for $17,500, a man made $5,000. What was his per cent. of gain? At what per cent. of the cost did he sell the house?

10. What is the selling price of property, for selling which a broker receives $450, or 1½ %?

11. If wheat is bought for $1.20 per bushel and sold for $.90 per bushel, what is the per cent. of loss?

INTEREST.

326. Interest is money paid for the use of money.

1. Mr. Banks lends Mr. Brown $500 for 2 years at 5 %. How much does Mr. Brown pay for the use of the money?

5 % for 1 year gives 10 % for 2 years; 10 % of $500 = $50. Ans.

2. How much interest must Mr. Jones pay for the use of $1,000 for 4 years at 5 %?

5 % for 1 year gives 20 % for 4 years; 20 % = $\frac{1}{5}$; $\frac{1}{5}$ of $1,000 = $200.

3. Mr. Hall borrowed $200 for 2 years 6 months ($2\frac{1}{2}$ years) at 4 %. How much was the interest?

$2\frac{1}{2} \times 4 = 10$ %; $.10 \times \$200 = \$20$. Ans.

327. To find the interest on any sum of money at any rate for any time expressed in years, multiply together the rate for one year, the number of years, and the given sum of money.

6 mos. = $\frac{1}{2}$ yr.; 4 mos. = $\frac{1}{3}$ yr.; 3 mos. = $\frac{1}{4}$ yr.; 2 mos. = $\frac{1}{6}$ yr.; 1 mo. = $\frac{1}{12}$ yr.

328. Find the interest:

4 %, $100 for		5 %, $200 for		6 %, $100 for		6 %, $200 for	
1. 2 yrs.	0 mos.	*5.* 2 yrs.	0 mos.	*9.* 1 yr.	6 mos.	*13.* 2 yrs.	0 mos.
2. 5 "	0 "	*6.* 4 "	0 "	*10.* 1 "	4 "	*14.* 2 "	6 "
3. 2 "	6 "	*7.* 5 "	0 "	*11.* 1 "	2 "	*15.* 2 "	2 "
4. 2 "	3 "	*8.* 2 "	6 "	*12.* 2 "	4 "	*16.* 3 "	4 "

329. Find the interest:

4 %, 2 yrs. 6 mos. on		5 %, 4 yrs. 0 mos. on		6 %, 3 yrs. 4 mos. on	
1. $100	*5.* $50	*9.* $800	*13.* $5	*17.* $2,000	*21.* $500
2. $200	*6.* $25	*10.* $400	*14.* $4	*18.* $5,000	*22.* $50
3. $250	*7.* $10	*11.* $250	*15.* $3	*19.* $4,000	*23.* $250
4. $500	*8.* $5	*12.* $50	*16.* $2	*20.* $4,500	*24.* $750

330. To find the interest on any sum of money at any rate for any time expressed in days.

1. Find the interest on $18,000 for 1 day at 6 %.

$\$18,000 \times \frac{6}{100} \times \frac{1}{360} =$

$\$18,000 \times \frac{1}{6000} = \$3$

Explanation.—1. The interest for 1 year is $6\% = .06 = \frac{6}{100}$. Multiply $18,000 by $\frac{6}{100}$ to find the interest for one year.

2. Counting 12 × 30 or 360 days to the year, divide the interest for 1 year by 360, or multiply it by $\frac{1}{360}$.

3. In cancelling it is seen that the interest at 6 % for one day is found by multiplying the given sum by $\frac{1}{6000}$ or by dividing by 6,000.

2. Find the interest on $500 for 12 days at 6 %.

$\$500 \times \frac{1}{6000} \times 12 = \$1$

Explanation.—1. Find the interest for 1 day by dividing by 6,000.

2. Find the interest for 12 days by multiplying by 12.

3. Find the interest on $8,000 for 45 days at 6 %.

$8000
45
6000)360000
$60

Explanation. — Multiplying by 45 and dividing by 6,000 is the same as dividing by 6,000 and multiplying by 45.

331. To find the interest on any sum of money at 6 % for any time expressed in days, multiply the sum of money by the number of days, and divide by 6,000.

To find the interest at 1 %, divide the result by 6; multiplying the interest at 1 % by any number will give the interest for that number of per cent. Thus, if the interest at 6 % is $60, the interest at 1 % is $10, and the interest at 7 % is $70.

332. Find the interest at 6 % on:

$1,000 for	$600 for	$400 for	$250 for	$360 for
1. 60 days.	*5.* 50 days.	*9.* 15 days.	*13.* 24 days.	*17.* 50 days.
2. 30 "	*6.* 90 "	*10.* 45 "	*14.* 72 "	*18.* 25 "
3. 15 "	*7.* 60 "	*11.* 75 "	*15.* 48 "	*19.* 75 "
4. 10 "	*8.* 45 "	*12.* 90 "	*16.* 12 "	*20.* 100 "

333. Find the interest at 6 % for:

30 days on	33 days on	60 days on	63 days on	90 days on
1. $200	*5.* $2,000	*9.* $1,000	*13.* $4,000	*17.* $400
2. 1,000	*6.* 3,000	*10.* 1,500	*14.* 6,000	*18.* 4,500
3. 800	*7.* 2,500	*11.* 2,000	*15.* 2,000	*19.* 5,000
4. 600	*8.* 5,000	*12.* 4,000	*16.* 2,500	*20.* 5,600

334. Find the interest in Arts. 332 and 333 at 2 %, 3 %, 4 %, 5 %, 7 %, 8 %, 9 %, 10 %, 11 %, 12 %.

2 % = ⅓ of 6 %; 4 % = 6 % − ⅓ of 6 %; 5 % = 6 % − ⅙ of 6 %; 9 % = 6 % + ½ of 6 %.

335. To find the interest on any sum of money at any rate for any number of years, days, and months, multiply the sum of money by the rate to find the interest for one year; divide this result by twelve to find the interest for one month, and divide this result by thirty to find the interest for one day. The interest for one year, month, and day should be multiplied by the number of years, months, and days, and the results added.

1. Find the interest on $500 at 6 % for 3 years, 5 months, 12 days.

$500
.06
12)$30.00 Interest for one year.
30) $2.50 Interest for one month.
$.08⅓ Interest for one day.
$30.00 × 3 = $90.00, Int. for 3 yrs.
$2.50 × 5 = 12.50, Int. for 5 mos.
$.08⅓ × 12 = 1.00, Int. for 12 das.
$103.50. Ans.

Explanation.—1. The interest for one year is .06 of $500, or $30.

2. Divide interest for one year by 12, giving $2.50 interest for 1 month.

3. Divide $2.50 by 30 to find the interest for 1 day.

4. Multiply $30 by 3; $2.50 by 5, and .08⅓ by 12.

5. Adding the results gives as the interest for 3 years, 5 months, 12 days, $103.50. Ans.

BUSINESS FORMS.

336. Business forms are generally printed in blank, and, when used, they have the proper names, amounts, and dates written in places, which, in the following forms, are indicated by dotted lines.

337. RECEIPT ON ACCOUNT.

$ *500.* New York, *Feb. 1,* 188 *8*

Received from *Walter Webb,*

Five hundred dollars on account.

Samuel Lester.

338. RECEIPT IN FULL.

$ *250.* Raleigh, *March 3,* 188 *8*

Received from *Edward Moore,*

Two hundred fifty dollars, in full of account to date.

Richard Johnson.

339. BANK CHECK.

No. *603.* Boston, *June 1,* 188 *8*

First National Bank

Pay to the order of *Matthew Morrison,*

Four hundred fifty 33/100 Dollars.

$ *450* 33/100 *Edward Lawson.*

340. PROMISSORY NOTE.

$ *250.* New Orleans, *Jan. 1,* 188 *9*

Three months after date *I* promise to pay to the order of *John Parker,*

Two hundred fifty 00/100 Dollars

at the *Third National Bank.*

Value received.

No. *38.* Due *April 1/4.* *Nathan Edson.*

341. DRAFT.

$ *1,000.* Cincinnati, *July 1,* 188 *8*

Ten days after sight pay to the

Order of *Henry Johnson,*

One thousand 00/100 Dollars

Value received, and charge to the account of

To *Smith & Martin,* *San Francisco, Cal.* } *Robert Sawyer.*

342. Find the interest at 5, 6, and 7 % on notes, as follows:

$250 for			$740 for			$1,000 for		
1. 3 yrs.	3 mos.	3 das.	*4.* 1 yrs.	9 mos.	20 das.	*7.* 1 yrs.	1 mos.	3 das.
2. 4 "	2 "	6 "	*5.* 2 "	1 "	9 "	*8.* 1 "	5 "	10 "
3. 3 "	6 "	10 "	*6.* 2 "	2 "	12 "	*9.* 2 "	5 "	15 "

1 yrs. 0 mos. 10 das. on			5 yrs. 5 mos. 5 das. on		
10. $100.	*13.* $250.	*16.* $365.	*19.* $500.	*22.* $1,000.	*25.* $2,000.
11. $150.	*14.* $375.	*17.* $500.	*20.* $450.	*23.* $950.	*26.* $2,500.
12. $175.	*15.* $280.	*18.* $650.	*21.* $400.	*24.* $725.	*27.* $3,050.

MEASUREMENT.

343. A **compound number** is a number composed of units of different names or denominations.

5 yards 2 feet 3 inches, is a compound number.

344. Reduction is changing a quantity from one denomination to another.

345. Changing a number to units of a lower denomination is called **reduction descending.**

Thus, changing dollars to cents, or bushels to quarts, is *reduction descending.*

346. Changing a number to units of a higher denomination is called **reduction ascending.**

Thus, changing cents to dollars, or inches to yards, is *reduction ascending.*

347. To reduce to lower denominations, multiply the given number by the number of units of the next lower denomination that make one of the higher, and so proceed until the required denomination is obtained.

If there are units of different denominations in the given number, add them to the products of the same denomination before reducing to the next lower denomination.

1. Find the number of inches in 10 yards 2 feet 4 inches.

10 yd. 2 ft. 4 in.
3
32 = (3 × 10) + 2, or 32 ft.
12
388 = (12 × 32) + 4, or 388 in. Ans.

Explanation.—1. Since there are 3 feet in each yard, multiply the 10 yards by 3 to reduce to feet, and add the 2 feet to the product.

2. Since there are 12 inches in each foot, multiply the 32 feet by 12 and add the 4 inches to the product, obtaining for the answer, 388 inches.

348. To reduce to higher denominations, divide the given number by the number of units that make one of the next higher denomination, and so proceed until the required denomination is obtained.

If there is a remainder after any division, write it as a number of the same denomination as the dividend of which it was a part.

1. Find the number of yards in 388 inches.

12)388 in.
3)32 ft. 4 in.
10 yd. 2 ft.
Ans., 10 yd. 2 ft. 4 in.

Explanation.—1. Since there are 12 inches in each foot, divide the 388 inches by 12 to reduce to feet, and write the remainder as 4 inches.

2. Since there are 3 feet in each yard, divide the 32 feet by 3 to reduce to yards, and write the remainder as 2 feet. Answer, 10 yd. 2 ft. 4 in.

Length.

349. A **line** is that which has length only.

Long Measure.

12 inches (in.) make 1 foot, . ft.		320 rods . . make . 1 mile, mi.	
3 feet . . " 1 yard, . yd.		5,280 feet, 1,760 yards, . " . 1 mile.	
5½ yards, 16½ feet, . " 1 rod, . rd.		3 miles . . . " . 1 league.	

A furlong (fur.) equals *one-eighth* of a mile.

350. Find the number of:

inches in			feet in
1. 3 ft.	*4.* 3 yd.	*7.* 2 yd. 2 ft.	*10.* 5 rd. 2 yd. 1 ft.
2. 5 ft.	*5.* 2 rd.	*8.* 4 rd. 3 yd.	*11.* 1 mi. 15 rd. 2 ft.
3. ⅓ ft.	*6.* 1 mi.	*9.* 2 mi. 5 yd.	*12.* 3 mi. 3 yd. 1 ft.

yards in		yards in	miles in
13. 150 rd.	*16.* 100 in.	*19.* 10 mi.	*22.* 100,000 in.
14. 226 rd.	*17.* 125 ft.	*20.* 100 ft.	*23.* 15,000 ft.
15. 500 mi.	*18.* 316 in.	*21.* 50 rd.	*24.* 1,000 rd.

The preceding examples illustrate *reduction ascending* and *reduction descending*.

Surface.

351. A **surface** has length and breadth only, as the *surface* of this page, of the floor, etc.

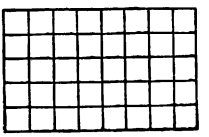
Square Measure.

144	square inches (sq. in.)	make	1 square foot,	sq. ft.
9	square feet	"	1 square yard,	sq. yd.
30¼	square yards	"	1 square rod, or perch,	sq. rod. P.
40	square rods	"	1 rood,	R.
4	roods	"	1 acre,	A.
640	acres	"	1 square mile,	sq. mi.

352. A **square** is a flat surface with four equal sides and four equal angles. A square inch is a square each of whose sides is one inch in length.

353. A **rectangle** is a flat surface with four straight sides and four square angles or corners.

354. To find the area, or number of square units in a rectangle, or in a square, multiply the number of units in the length by the number in the breadth. Thus, if a slate is 8 inches long and 5 inches wide, its surface contains 5 × 8 or 40 square inches.



355. Written Problems. 1. What is the area, or number of square units, in a floor 27 feet long and 13 feet wide?

2. If a pavement is 18 feet long and 12 feet wide, how many square feet of surface has it?

3. How many square feet are there in a passage-way 12 feet long and 3 feet wide? How many square yards?

4. A rectangular field was 250 rods long and 125 rods wide. How many acres did the field contain?

5. In a territory having the shape of a square, each of the sides being 225 miles long, how many acres are there?

6. If the area of the side of a wall is 98 square feet and its height is 14 feet, what is its length?

7. How many feet in length is a room, if it is 5 yards wide and has 25 square yards of surface in its floor?

Volume.

356. A **solid** has length, breadth, and thickness.

Cubic Measure.

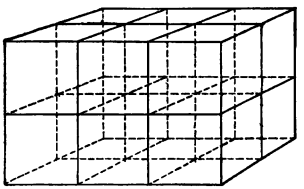
1,728 cubic inches (cu. in.) . .	make . .	1 cubic foot, .	cu. ft.
27 cubic feet	" . .	1 cubic yard, .	cu. yd.
128 cubic feet	" . .	1 cord, ...	C.

A pile of wood 8 feet long, 4 feet high, and 4 feet wide is a cord. One foot in length of this pile, or 16 cubic feet, is a cord foot.

357. A **cube** is a solid bounded by six equal squares.

A cubic foot is a cube each of whose edges is 1 foot long.

358. To find the volume, or number of cubic units, in any cube, or in any solid bounded by six rectangles, multiply together the number of units in the length, the breadth, and the thickness.



The length, breadth, and thickness must be expressed in units of the same denomination.

359. Written Problems. 1. How many cubic inches are there in a cubical block of wood, each of the edges being 5 inches in length?

2. What is the difference between 5 cubic inches and a cube each of whose edges is 5 inches long?

3. A block of ice is 5 feet long, 4 feet wide, and 2 feet 6 inches ($2\frac{1}{2}$ ft.) thick. How many cubic inches does the block contain?

4. How many cubic feet of air will a room 15 feet long, 12 feet wide, and 10 feet high contain? How many cubic inches? How many gallons?

A gallon contains 231 cubic inches.

5. How many cubic yards of earth must be removed to make a cellar 25 feet wide, 40 feet long, and 8 feet deep?

6. How many cubic yards of sand are there in a bank 1,000 feet long, 40 feet wide, and 25 feet deep?

Capacity.

360. **Liquid Measure.**

4 gills (gi.)	make	1 pint,	pt.
2 pints	"	1 quart,	qt.
4 quarts	"	1 gallon,	gal.
31½ gallons	"	1 barrel,	bl.
63 gallons	"	1 hogshead,	hhd.

361. **Dry Measure** (for seeds, etc.).

2 pints (pt.)	make	1 quart,	qt.
8 quarts	"	1 peck,	pk.
4 pecks	"	1 bushel,	bu.

A *Small Measure* equals 2 quarts. A barrel equals about 2¼ bushels.

362. Oral Problems. 1. How much will 3 gallons of milk cost at 8 cents a quart?

2. If apples sell for 3 cents a quart, what will a peck cost?

3. At 10 cents a peck, how much would a barrel of apples cost? How much will 10 barrels cost?

4. How much will 80 pints of oil cost at 12 cents a gallon?

5. If strawberries sell at $.96 a bushel, how much is a quart of the strawberries worth?

6. What is the cost of a pint of cranberries, if they are bought for $1.92 a bushel.

7. If 3 pints of milk cost $.12, what will 3 gallons cost?

363. Find the number of:

quarts in	pecks in	quarts in	pints in	bushels in
1. 100 gi.	*5.* 64 pt.	*9.* 25 pk.	*13.* 2 hhd.	*17.* 200 pt.
2. 100 gal.	*6.* 80 qt.	*10.* 18 bu.	*14.* 20 bu.	*18.* 200 qt.
3. 196 pt.	*7.* 40 bu.	*11.* 50 pt.	*15.* 50 gal.	*19.* 150 pk.
4. 225 bl.	*8.* 10 bl.	*12.* 12 pk.	*16.* 50 pk.	*20.* 325 qt.

Weight.

364. Avoirdupois Weight.

16 ounces (oz.)	make	1 pound,	lb.
25 pounds	"	1 quarter,	qr.
4 quarters, 100 pounds	"	1 hundred w't,	cwt.
2,000 pounds	"	1 ton,	T.

Used in weighing all substances except drugs at retail, and except gold, silver, and the precious stones.

365. Reduce the following:

to ounces.	to pounds.	to hundred wt.	to tons.
1. 1 T. 2 cwt. 2 lb.	*4.* 5 cwt. 5 qr.	*7.* 8 T. 17 cwt.	*10.* 20,000 oz.
2. 2 T. 5 cwt. 9 lb.	*5.* 10 T. 6 cwt.	*8.* 15,065 lb.	*11.* 1,788 lb.
3. 5 T. 0 cwt. 8 lb.	*6.* 6,000 oz.	*9.* 1,000 oz.	*12.* 2 cwt. 8 lb.

366. Troy Weight.

24 grains	make	1 pennyw't,	pwt.
20 pwt.	"	1 ounce,	oz.
12 ounces	"	1 pound,	lb.

Used in weighing gold, silver, and precious stones.

367. Apothecaries' Weight.

20 grains	make	1 scruple,	℈.
3 scruples	"	1 dram,	ʒ.
8 drams	"	1 ounce,	℥.
12 ounces	"	1 pound,	lb.

Used in weighing drugs at retail.

The Troy and Apothecaries' grain, ounce, and pound are the same.

368. Reduce the following:

to pennyweights.	to pounds.	to pounds.	to grains.
1. 725 lb. 12 pwt.	*3.* 1,019 pwt.	*5.* 7,850 ℈.	*7.* 5 ℥ 2 ʒ 2 ℈.
2. 170 oz. 20 pwt.	*4.* 9,672 gr.	*6.* 1,400 ʒ.	*8.* 3 lb. 5 ℥ 1 ℈.

Value.

369. U. S. Money.

10 mills (m.)	make	1 cent,	ct. or ¢.
10 cents	"	1 dime,	d.
10 dimes	"	1 dollar,	$.
10 dollars	"	1 eagle,	E.

£1 equals $4.86⅔.

370. English Money.

4 farthings (far.)	make	1 penny,	d.
12 pence	"	1 shilling,	s.
20 shillings	"	1 pound, or sov'gn.	£.

The guinea = 21 s.; the crown = 5 s.

371. Oral Problems. 1. How many pence are there in 8 farthings? In 12? In 10?

2. What part of a shilling is 2 pence? 3 pence?

3. How many shillings are there in £2? In £5?

4. In 2 shillings, how many pence are there?

5. How many shillings are there in 24 pence? In 60 d.?

6. In 50 dimes, how many dollars are there?

7. How many eagles are there in 200 dimes?

8. 3 eagles equal how many cents? 5 eagles?

372. Reduce the following:

to pence	to cents	to pounds	to dollars	to shillings
1. £1.15 s. 3 d.	*4.* $5.00.	*7.* 500 s. 6 d.	*10.* 5286 ¢.	*13.* £684.5 s.
2. £5.10 s. 6 d.	*5.* $6.70.	*8.* 125 s. 0 d.	*11.* 6845 d.	*14.* 1080 d. 2 f.
3. £10.0 s. 10 d.	*6.* $7.25.	*9.* 680 s. 3 d.	*12.* 800 E.	*15.* £250.10 s.

373. **Time.**

60 seconds (sec.)	. . . . .	make	. . . 1 minute,	. . min.
60 minutes	. . . . .	"	. . . 1 hour,	. . . hr.
24 hours	. . . . .	"	. . . 1 day,	. . . da.
7 days	. . . . .	"	. . . 1 week,	. . wk.
365 days	. . . . .	"	. . . 1 year,	. . yr.

Every fourth year is called a leap year, and contains 366 days. If the number of a year is divisible by 4, it represents a leap year. No number, however, ending in two ciphers represents a leap year, unless it is divisible by 400.

374. Oral Problems. 1. How many seconds are there in two minutes? In 4 minutes? In $\frac{1}{2}$ of a minute? In $\frac{3}{5}$ of a minute? In $\frac{7}{10}$ of a minute?

2. In 120 seconds, how many minutes are there? In $3\frac{1}{2}$ hours? In $8\frac{1}{3}$ hours?

3. How many hours are there in 2 days? In $3\frac{1}{2}$ days?

4. In 48 hours, how many days are there? In 75 hours?

5. How many days are there in 3 weeks? In $4\frac{1}{2}$ weeks?

6. In 30 days how many weeks are there? In 46 days?

7. If Frank earns $2\frac{1}{2}$ ¢ in a minute, how much will he earn in an hour?

8. What part of an hour are 2 minutes? 3 minutes? 15 minutes?

9. How many seconds are there in one hour? In 10 hours?

10. In 5 days how many hours are there? In 10 days? In 20 days?

11. How many hours are there in a month of 30 days? Of 31 days?

375. Reduce the following:

to hours	to days	to minutes
1. 5 wk. 6 hr.	*3.* 473,560 min.	*5.* 60,807,012 sec.
2. 1 mos. 5 das.	*4.* 12 yrs. 100 das.	*6.* 5 wks. 5 das.

In reducing months to days, multiply by 30; in reducing years to days, multiply by 365 and add one day for every leap year.

376. The year is divided into months, called calendar months, whose names and number of days are as follows:

1. January, . . .	31 days.	*7.* July, ...	31 days.
2. February, . .	28 "	*8.* August, . . .	31 "
3. March, ...	31 "	*9.* September, .	30 "
4. April, ...	30 "	*10.* October, . .	31 "
5. May, ...	31 "	*11.* November, .	30 "
6. June, ...	30 "	*12.* December, .	31 "

In leap years, February has 29 days.

377. The number of days in each month may be easily remembered by the following couplet:

Thirty days hath September,
April, June, and November.

ADDITION.

378. To add compound numbers, write the numbers to be added so that units of the same denomination stand in the same column. Add the units in the right-hand column and divide their sum by the number of units that make one of the next higher denomination. Write the remainder, if any, under the first column, and add the quotient with the units of the next higher denomination, and so proceed, until the entire sum is found.

1. Find the sum of 12 sq. yd. 8 sq. ft. 116 sq. in.; 9 sq. yd. 7 sq. ft. 43 sq. in.; 11 sq. yd. 5 sq. ft. 71 sq. in.; 10 sq. yd. 3 sq. ft. 2 sq. in.

sq. yd.	sq. ft.	sq. in.
12	8	116
9	7	43
11	5	71
10	3	2
44	6	88

Explanation.—1. The sum of the square inches is 232. Dividing by 144 to reduce to square feet gives 1 sq. ft. 88 sq. in. Write 88 under the sq. in., and add the 1 with the sq. ft.

2. The sum of the square feet is 24. Dividing by 9 to reduce to sq. yd. gives 2 sq. yd. and 6 sq. ft. Write 6 under the square feet and add the 2 with the square yards.

3. The sum of the square yards is 44. Answer, 44 sq. yd. 6 sq. ft. 88 sq. in.

2. A farmer sold wheat to four persons; to the first, 108 bu. 2 pk. 2 qt.; to the second, 350 bu. 2 pk. 3 qt.; to the third, 410 bu. 2 pk. 3 qt.; and to the fourth, 530 bu. 1 pk. How much did he sell to all?

3. A provision dealer bought pork of three persons; of the first, 73 cwt. 3 qr. 10 lb.; of the second, 89 cwt. 2 qr. 12 lb.; of the third, 36 cwt. 2 qr. 3 lb. What was the entire weight of the pork that he bought?

4. Mr. James travelled 18 mi. 125 rd. 3 yd., 15 mi. 223 rd. 2 yd., and had 24 mi. 300 rd. 1 yd. still to travel. What was the entire distance?

SUBTRACTION.

379. To subtract in compound numbers, write the less number under the greater, placing units of the same denomination in the same column. Beginning at the right, subtract the units of each denomination in the lower line from those of the same denomination in the upper line. If the number of units of any denomination in the lower line is greater than the number in the upper line, take one of the units of the next higher denomination in the upper line, reduce it and add it to the units of the required denomination and then subtract.

Write 0's where there are no units of a given denomination.

1. From 14 cwt. 2 qr. 8 lb. take 12 cwt. 11 lb.

cwt.	qr.	lb.
14	2	8
12	0	11
2	1	22

Explanation.—1. As 11 lb. cannot be taken from 8 lb., take 1 of the 2 qr.; leaving 1 qr.; change the 1 qr. to lb., making 25 lb., and add it to the 8 lb., making 33 lb. 11 from 33 leaves 22. Write 22 under the first column.

2. 0 qr. from 1 qr. equals 1 qr. Write 1 under the second column.

3. 12 cwt. from 14 cwt. leaves 2 cwt. Ans. 2 cwt. 1 qr. 22 lb.

2. A man bought a farm of 263 A. 3 R. 10 P., and sold 152 A. 1 R. 30 P. How much did he have left?

3. A farmer bought a load of hay weighing 17 cwt. 10 lb., but 6 cwt. 1 qr. 15 lb. of the hay was spoiled. How much was good hay?

4. From £25. 18 s. 6 d. take £19. 19 s. 7 d. What remains?

5. How much time is there between January 3, 1886, and March 15, 1888?

The second date is written 1,888 years, 3 months, 15 days.

6. From November 1, 1886, to March 8, 1888, how long is the time? From June 30, 1882, to September 1, 1889?

MULTIPLICATION.

380. To multiply a compound number, write the multiplier under the last denomination at the right, and beginning at the right multiply in succession the units of the different denominations, finding, as in addition, how many units are to be carried to the product of the next higher denomination.

1. Multiply 7 lb. 2 oz. 7 pwt. by 5.

lb.	oz.	pwt.
7	2	7
		5
35	11	15

Explanation.—1. Multiply the 7 pwt. by 5 making 35 pwt., or 1 oz. 15 pwt. Write 15 under the pwt. and add the 1 oz. to the product of the oz.

2. Multiply the 2 oz. by 5 making 10 oz. which with the 1 oz. make 11 oz. Write 11 under the oz.

3. Multiply the 7 lb. by 5 making 35 lb. Answer, 35 lb. 11 oz. 15 pwt.

2. A ten-dollar gold piece weighs 10 pwt. 18 gr. How much do 11 ten-dollar gold pieces weigh?

3. If a half dollar weighs 8 pwt., 49 half dollars weigh how much?

4. What is the weight of 9 hhd. of pork, each hhd. weighing 9 cwt. 2 qr. 13 lb.?

5. Multiply £12. 13 s. 9 d. by 27.

Multiply by 9 and then by 3; or, by 3 × 3 × 3.

DIVISION.

381. To divide a compound number by an abstract number, write the divisor at the left of the dividend, and beginning at the left, divide in succession the number of units of the different denominations. If after any division there is a remainder, reduce it to the next lower denomination; add it to the units, if any, of that denomination, and then divide the sum by the divisor.

1. Find the quotient of 24 lb. 7 oz. 8 pwt. divided by 12.

	lb.	oz.	pwt.	gr.
12)	24	7	8	0
	2	0	12	8

Explanation.—1. Write the divisor at the left of the dividend.

2. Dividing 24 lb. by 12 gives 2 lb. Write 2 under the lb.

3. As 7 oz. cannot be divided by 12, write 0 under the oz.

4. The 7 oz. remainder equal 140 pwt. which with the 8 pwt. makes 148 pwt. Dividing 148 pwt. by 12, gives 12 pwt. with a remainder of 4 pwt. Write 12 under the pwt.

5. The 4 pwt. remainder equals 96 gr., which divided by 12 gives 8 gr. Write 8 under the gr. Answer, 2 lb. 0 oz. 12 pwt. 8 gr.

2. If 12 acres of land are worth £148. 6 s., how much is one acre worth ?

3. If 15 horses cost £151. 18 s. 9 d., what is the average cost per horse ?

Divide by 3 and then by 5 ; or, by 5 and then by 3.

4. A captain distributes 2 cwt. 3 qr. 14 lb. 1 oz. of pork equally among the 125 men in his command. How much does each man receive ?

5. Mr. Maines walked 7 miles 30 rods in 11 hours. How far did he walk per hour ?

382. To divide by a compound number of the same kind as the dividend, reduce both divisor and dividend to the same denomination, and then divide as in simple numbers.

1. How many coal bins, containing 4 cwt. 1 qr. 6 lb. of coal, are required to hold 7 T. 15 cwt. 16 lb. of coal ?

2. At £1. 7d., how many volumes of an encyclopædia can be bought for £14. 8s. 2d. ?

3. How many tanks holding 62 gal. 1 qt. 1 pt. will be required to hold 998 gallons of oil ?

4. If each gold watch weighs 5 oz. 5 pwt. 5 gr., how many gold watches together weigh 4 lb. 4 oz. 12 pwt. 2 gr. ?

5. If each silver spoon weighs 1 oz. 15 pwt., how many dozen silver spoons will weigh 20,160 gr. ?

ANSWERS.

Art. 43.

2. 168,988.
3. 467,776.
4. 288,556.
5. 565,785.

Art. 47.

2. 591,484.
3. 395,207.
4. 616,883.
5. 475,130.

Art. 48.

1. 996,597.
2. 742,946.
3. 990,038.
4. 903,732.
5. 920,541.
6. 924,691.
7. 893,904.
8. 722,876.

Art. 49.

1. $32,609.
2. 16,895 A.
3. 50,380 bl.
4. $38.23.
5. 168 pupils.
6. $1,775.
7. 770 pears.
8. 784 A.
9. 1,841.
10. 169 yd.
11. 3,010 pp.
12. 4,782 trees.
13. 1,380 trees.
14. 10,020 trees.
15. $1,901.
16. $5,300.
17. $34,780.
18. $605.
19. 2,070 kernels.
20. 139 boys;
    142 girls;
    281 boys and girls.
21. 107 lb.;
    $16.40.
22. $17,200.
23. 28,604.
24. 5,988 mi.

Art. 62.

1. 314.
2. 446.
3. 248.
4. 356.
5. 59.
6. 308.
7. 216.
8. 15.
9. 187.
10. 198.
11. 329.
12. 174.
13. 739.
14. 3,974.
15. 1,087.
16. 8,491.
17. 7,463.
18. 3,779.
19. 2,165.
20. 1,397.
21. 6,518.
22. 3,471.
23. 1,819.
24. 4,591.
25. 3,677.
26. 8,483.
27. 2,967.
28. 8,100,008.
29. 6,655,556.
30. 2,999,990.
31. 6,299,991.
32. 21,669;
    28,497.
33. 86,226;
    76,194.
34. 18,694;
    1,785;
    33,825.
35. 14,235;
    43,367;
    9,222;
    1,953.

Art. 63.

1. 1,743.
2. 11,011,112.
3. 484.
4. 38,534.
5. 2,313 gr.
6. $778.
7. 1,769.
8. $10,483.
9. 5.
10. 48; 117; 435.
11. 41 mi.
12. 80,478 mi.
13. 26,228 mi.
14. 538 lb.

Art. 65.

1. $19.75; $12.50.
2. $252.50.
3. $99; $1.
4. $2,000.
5. 2,580.
6. $8,350.
7. $33.
8. A, $4,351.
9. $475.
10. 3,800.
11. No, 1 ¢ too little.
12. 50.
13. 70 ¢.

Art. 80.

2. 20,562.
3. 36,463.
4. 24,300.
5. 43,615.
6. 41,888.
7. 41,652.
8. 61,224.
9. 25,248.
10. 31,743.
11. 48,895.
12. 45,528.
13. 81,072.
14. 64,712.
15. 69,885.
16. 62,363.

30. 55 ¢.
31. $90.
32. 30,380 lb.
33. 126 T.
34. $50.
35. 236 head.
36. $378.
37. $1.30.
38. $105.
39. 12 das; $327.60.
40. 10,569.
41. 5,053.
42. 71.
43. 1,703.
44. 74,425.
45. 6,369.
46. 4,041.
47. 20 mos.
48. $1,500.
49. 187 mi., 360 yd.
50. $5.50.
51. 50 hr.
52. 12 das.
53. 2880 min.; 7,200 min.
54. $10.
55. The first, 2,050 min.
56. $162.
57. $3,078.60.
58. 28.

Art. 183.

3. 92\frac{1}{2}$.
4. $135.
5. 139\frac{5}{8}$.
6. 472\frac{9}{20}$.
7. 501\frac{23}{24}$.
8. $506.
9. 585\frac{4}{7}$.
10. $1,313$\frac{23}{60}$.

Art. 184.

1. 83$\frac{1}{6}$ yd.
2. 45\frac{1}{8}$.
3. 163\frac{4}{7}$.
4. 52\frac{1}{20}$.
5. 5\frac{5}{8}$.
6. $50.
7. 10$\frac{1}{2}$ yrs.
8. 28\frac{1}{2}$.
9. 81$\frac{3}{4}$ mi.
10. 24\frac{1}{4}$.
11. 110$\frac{23}{24}$.

Art. 195.

1. $\$\frac{1}{4}$.
2. $\$3\frac{3}{4}$.
3. $\$9\frac{4}{5}$.
4. $\$22\frac{7}{10}$.
5. $\$10\frac{1}{10}$.
6. 9$\frac{5}{8}$ yd.
7. 18$\frac{13}{15}$ A.
8. $\$5\frac{1}{6}$.
9. $\$4\frac{4}{5}$.

Art. 196.

1. $\frac{1}{12}$.
2. $\$1\frac{3}{40}$.
3. 1$\frac{7}{12}$ yd.
4. $\$31\frac{7}{10}$.
5. $\$35\frac{1}{4}$.
6. $\$13\frac{3}{4}$.
7. 24$\frac{1}{4}$ gal.
8. $\$2\frac{1}{8}$.
9. 147$\frac{5}{16}$ lb.
10. $\$32\frac{1}{20}$.
11. $\$5\frac{2}{5}$.

Art. 207.

1. $3,600.
2. $350,000.
3. $5.94.
4. $1.55.
5. 333\frac{1}{3}$.
6. 93\frac{3}{4}$.
7. $875.
8. $13.80.
9. $375,000.
10. $4,060.

Art. 217.

1. $85.
3. $50.
4. $4.68.
5. $16,700.
6. 1,848 ft.
7. $450.
8. $450.
9. 85\frac{1}{2}$.
10. $224.
11. $200.
12. 44 yrs.
13. 64$\frac{1}{2}$ T.

Art. 221.

1. 58$\frac{1}{3}$ ¢.
2. 21 mi.
3. $29.
4. 22$\frac{1}{2}$ gal.
5. $.45$\frac{3}{8}$.
6. 77 ft.
7. 7\frac{9}{16}$.
8. $100.
9. 105 mi.

Art. 223.

4. $120.
5. $681.
6. 235\frac{1}{2}$.
7. 2,296.
8. 1,197.
9. 3,128.
10. 875.
11. 1,311.
12. 2,442.
13. 370.
14. 903.
15. 4,575.
16. 2,664.
17. 1,233$\frac{3}{4}$.
18. 4,532.

Art. 228.

1. 100 bus.
2. 32 baskets.
3. 400 min.
4. 245 loaves.
5. 50 books.
6. 66$\frac{2}{3}$ das.
7. 40 hats.

Art. 233.

1. $\$\frac{1}{50}$.
2. $\$\frac{1}{100}$.
3. $\$\frac{3}{320}$.
4. $\frac{1}{80}$ yd.
5. $\$\frac{1}{100}$.
6. $\$\frac{1}{160}$.

Art. 236.

1. $\frac{27}{56}$.
2. 1$\frac{13}{35}$.
3. $\frac{44}{45}$.
4. $\frac{15}{56}$.
5. 1$\frac{13}{60}$.
6. 2$\frac{19}{27}$.
7. 1$\frac{5}{72}$.
8. 1$\frac{1}{24}$.
9. $\frac{48}{49}$.
10. 1$\frac{1}{80}$.
11. $\frac{9}{10}$.
12. 1.
13. $\frac{7}{16}$.
14. $\frac{10}{11}$.
15. 1$\frac{1}{2}$.
16. 2.
17. $\frac{2}{3}$.
18. 1.
19. 1.
20. 1$\frac{1}{2}$.

Art. 237.

1. 1$\frac{1}{8}$ yd.; $\frac{3}{4}$ yd.
2. $\frac{4}{7}$ min.; $\frac{11}{21}$ min.; $\frac{6}{7}$ min.; $\frac{33}{35}$ min.
3. $\frac{2}{3}$ lb.; 1$\frac{1}{3}$ lb.; 1$\frac{1}{6}$ lb.; 2$\frac{2}{9}$ lb.; 1$\frac{2}{3}$ lb.; 1$\frac{1}{4}$ lb.; 2$\frac{2}{3}$ lb.
4. 60 qts.; 7$\frac{1}{2}$ qts.; 9 qts.
5. 12$\frac{1}{2}$ times.
6. 12 pitchers.
7. 2$\frac{1}{25}$ min.
8. 14 rolls.
9. 1$\frac{1}{5}$ baskets.
10. 1$\frac{1}{2}$ times.
11. 1$\frac{1}{20}$ hr.
12. 1$\frac{1}{6}$ hr.
13. 1$\frac{1}{5}$ times.
14. 3$\frac{1}{2}$ remnants.
15. 4$\frac{3}{4}$ yd.
16. 1$\frac{1}{2}$ times.

Art. 239.

Without Cancellation.

1. $\frac{6}{35}$.
2. $\frac{49}{54}$.
3. $\frac{13}{35}$.
4. $\frac{8}{21}$.
5. $\frac{17}{42}$.
6. $\frac{44}{45}$.
7. 2$\frac{2}{3}$.
8. $\frac{5}{54}$.

9. $\frac{25}{108}$.
10. $2\frac{13}{16}$.
11. $1\frac{13}{32}$.
12. $2\frac{14}{33}$.
13. $7\frac{1}{3}$.
14. $\frac{5}{36}$.
15. $\frac{13}{65}$.
16. $4\frac{7}{12}$.

With Cancellation.

1. $\frac{2}{3}$.
2. $\frac{8}{9}$.
3. $1\frac{3}{4}$.
4. $\frac{1}{4}$.
5. $1\frac{1}{4}$.
6. $3\frac{1}{2}$.
7. $4\frac{1}{2}$.
8. $1\frac{2}{3}$.
9. $1\frac{1}{2}$.
10. $\frac{2}{5}$.
11. 6.
12. $\frac{2}{3}$.
13. $1\frac{1}{2}$.
14. $\frac{3}{4}$.
15. 4.
16. $4\frac{1}{2}$.

Art. 240.

1. $2\frac{2}{9}$ yd.
2. $1\frac{1}{2}$ baskets.
3. 18 scarfs.
4. $\$16\frac{1}{2}$.
5. 6 dresses.
6. 18 das.
7. 7 mos.; 9 mos.

Art. 244.

1. $19,200.
2. $1.44.
3. $27.36.
4. 48 yrs.
5. 45 ft.
6. $100.

Art. 247.

1. $64\frac{1}{3}$ ft.
2. $30\frac{7}{24}$ lb.
3. $\$20\frac{5}{6}$.
4. $\$33\frac{1}{3}$.
5. $\$77\frac{1}{2}$.
6. $24\frac{4}{7}$ mi.
7. $\$1\frac{73}{121}$.
8. $12,250.
9. $2.25; $4.50.
10. $\$301\frac{3}{20}$.
11. $63\frac{15}{16}$ A.
12. $149\frac{7}{10}$ bus.
13. $\$43\frac{3}{4}$.
14. $\$30\frac{7}{10}$.
15. $152\frac{11}{40}$ yd.
16. 14 T.
17. $10\frac{11}{28}$ yrs.
18. $35\frac{3}{8}$ lb.
19. $\$19\frac{5}{12}$.
20. $15\frac{3}{8}$ rd.
21. $66\frac{3}{8}$ mi.
22. $493.
23. $36\frac{1}{4}$ A.
24. $\$3.66\frac{3}{16}$.
25. $97\frac{3}{61}$ wk.
26. $\$92\frac{4}{9}$.
27. $42.
28. $\$94\frac{33}{38}$.
29. 15 tables.
30. $7\frac{31}{432}$ T.
31. $\$30.66\frac{1}{64}$.
32. 16,236.
33. Gained $\$81\frac{1}{12}$.
34. $91\frac{23}{40}$ yd.
35. $537\frac{23}{48}$.

Art. 275.

1. $441.99.
2. $89.382.
3. $213.40.
4. $223.575.
5. $27.573.
6. 30.126.
7. 27.42.
8. 55.555.
9. 10.1909.
10. 90.5168.

Art. 276.

1. $131.096.
2. $7.381.
3. $.889.
4. $37,392.
5. $.998.
6. 3.7108.
7. 42.003.
8. 68.0531.
9. 22.5592.
10. .909.
11. 21.021.
12. 499.95.
13. 3.415.
14. 1.4143.
15. 9.909.

Art. 278.

1. $28.30.
2. $13.50.
3. $4.06.
4. 24.1445.
5. $155.56.

Art. 279.

2. $252.585.
3. $4,902.24.
4. $649.066.
5. $48.692.
6. $6.3675.
7. 235.7784.
8. 114.9824.
9. 11016.7475.
10. 18283.534.
11. 621.8511.

Art. 284.

2. $.00192.
3. $.22396.
4. $.030072.
5. $.24004.
6. $120.60.
7. 4.644.
8. 29.3563.
9. 56492.7.
10. 29.17296.
11. .0518035.

Art. 286.

1. 109.25; 13.984; 2.4196; 6.9575; 42.55.
2. 1.62; 12.159; 3.64005; 4.608; 1.38375.
3. .072012; .005916; 2.754; .20876; .054944.
4. 13.33115; .08405; 180.605; 14.4935; .10045.
5. 43.0424064; 7.80644016; 10.0090008; 4 00360032; 45.8436456.

Art. 288.

1. $363.96+.
2. $43.67—.
3. $477.
4. 323.505125 bus.
5. $8.25.
6. $1,062.
7. $1,434.375.

Art. 289.

4. .0067+.
5. 2.152.
6. .092.
7. .00104.
8. .112.
9. .0033.
10. .75.
11. 3.6.
12. .7221.
13. .0331.

Art. 291.

1. .39; .0055; 2.8; .45; .6694.
2. .1603; .0006; 1.21; .1; .1224.
3. .0136; 1.07; .5032; .028; .6428.
4. .29; .087; .203; .0099; .3857.
5. .017; .0299; .085; .056; .0055.

Art. 295.

4. 95,000.
5. 132.6.
6. 8,007.
7. 30.2.
8. 330.
9. 10.94.
10. .0069.

Art. 297.

1. .7487; .0621; .8407; .5985.
2. 1120.3333; 80.0266; 342; 177.
3. 116.3043; 6.9565; 1,685.5434; .8695.
4. 200; 30.03; 2.2758; 4.8344.
5. .00089; .00007; .0056; .0014.

Art. 300.

1. $115,20.
2. $34.30.
3. $56.43.
4. $137.78—.
5. $564.25.
6. $219.80.
7. $110.57—.
8. $206.24—.
9. $1,068.75.
10. $866.81+.
11. $1,271.40.
12. $1,814.40.
13. $41.94+.
14. $10.76+.
15. $7.17—.
16. $3.29+.
17. $84.21.
18. $151.38—.
19. $19.95—.
20. $10.93—.
21. $128.78—.
22. $11.64+.
23. $37.08+.
24. $.90.
25. $10.
26. $5.60.
27. $15.78.
28. $2.37.
29. $1.63+.
30. $1.39+.
31. $2.31—.
32. $80.59—.
33. $281.53+.
34. $57.44+.
35. $.11+.
36. $26.82—.

Art. 301.

1. $54.
2. $547.59+.
3. $792.44—.
4. $4,590.
5. $810.

Art. 303.

1. $8937.50.
2. $800.
3. 1,875.
4. 70,016 pupils.
5. 2,006 books.
6. $3.75.
7. $4.06+.

Art. 305.

1. 204.934 T.
2. $87,500 gained.
3. $312,503.13—.
4. $175+; $25—loss.
5. $200.
6. $60.50.
7. 8,500 bus.
8. $15.75.
9. $11.40.
10. $23.59+.
11. 31.8 yd.
12. 200 das.
13. 2,160 bl.
14. $1,500.
15. 50 das.
16. $1873.44 gain.
17. $43.67—.
18. 18.75 T.
19. 11.49+ wk.
20. 400 yd.
21. $1⅝.
22. $1.75.

Art. 315.

1. $9,135.
2. $478.13—.
3. $30.94—.
4. $201.25.
5. $1,687.50.
6. $1,270.50.
7. $500.
8. $382.81+.
9. $450.
10. $62.50.
11. $281.25.
12. $405.

Art. 320.

1. $2,000; $1,460.
2. $266,666.67—; $267,866.67—.
3. $600,000; $615,000.
4. $6.
5. 2¼ ¢; 3 ¢.
6. $9,000; $10,500.
7. $3,666.67—.
8. $37,500.
9. $10,000.
10. $96,000.

Art. 325.

1. 25 %; 125 %.
2. $2,222⅔; $2,722⅔.
3. $51.39—.
4. $8,300.
5. 22⅔ %.
6. $42,857.14+.
7. 16⅔ %.
8. 20 %.
9. 28⅔ %; 128⅔ %.
10. $30,000.
11. 25 %.

Art. 328.

1. $8.
2. $20.
3. $10.
4. $9.
5. $20.
6. $40.
7. $50.
8. $25.
9. $9.
10. $8.
11. $7.
12. $14.
13. $24.
14. $30.
15. $26.
16. $40.

Art. 329.

1. $10.
2. $20.
3. $25.
4. $50.
5. $5.
6. $2.50.
7. $1.
8. $.50.
9. $160.
10. $80.
11. $50.
12. $10.
13. $1.
14. $.80.
15. $.60.
16. $.40.
17. $400.
18. $1,000.
19. $800.
20. $900.
21. $100.
22. $10.
23. $50.
24. $150.

Art. 332.

1. $10.
2. $5.
3. $2.50.
4. $1.67—.
5. $5.
6. $9.
7. $6.
8. $4.50.
9. $1.
10. $3.
11. $5.
12. $6.
13. $1.
14. $3.
15. $2.
16. $.50.
17. $3.
18. $1.50.
19. $4.50.
20. $6.

Art. 333.

1. $1.
2. $5.
3. $4.
4. $3.
5. $11.
6. $16.50.
7. $13.75.
8. $27.50.
9. $10.
10. $15.
11. $20.
12. $40.
13. $42.
14. $63.
15. $21.
16. $26.25.
17. $6.
18. $67.50.
19. $75.
20. $84.

Art. 342.

1. $40.73—; $48.88—; $57.02.
2. $52.29; $62.75; $73.21—.
3. $44.10—; $52.92—; $61.74—.
4. $66.81—; $80.17—; $93.53—.
5. $78.01—; $93.61—; $109.21.
6. $81.40; $97.68; $113.96.
7. $54.58+; $65.50; $76.42—.
8. $72.22—; $86.67—; $101.11.
9. $122.92—; $147.50; $172.08.
10. $5.14—; $6.17—; $7.19+.
11. $7.71—; $9.25; $10.78+.
12. $8.99+; $10.79+; $12.59+.
13. $12.85—; $15.42—; $17.98+.
14. $19.27+; $23.12+; $26 98—.
15. $14.39—; $17.27—; $20.14+.
16. $18.76—; $22.51—; $26.26—.
17. $25.69+; $30.83+; $35.97+.
18. $33.40+; $40.08+; $46.76+.
19. $135.76+; $162.92—; $190.07—.
20. $122.19—; $146.62+; $171.06+.
21. $108.61+; $130.33+; $152.06—.
22. $271.53—; $325.83+; $380.14—.
23. $257.95+; $309.54+; $361.13+.
24. $196.86—; $236.23—; $275.60+.
25. $543.06—; $651.67—; $760.28—.
26. $678.82—; $814.58+; $950.35—.
27. $828.16—; $993.79+; $1,159.42+.

Art. 350.

1. 36 in.
2. 60 in.
3. 4 in.
4. 108 in.
5. 396 in.
6. 63,360 in.
7. 96 in.
8. 900 in.

9. 126,900 in.
10. 89 ft. 6 in.
11. 5,529 ft. 6 in.
12. 15,850 ft.
13. 825 yd.
14. 1,243 yd.
15. 880,000 yd.
16. 2 yd. 2 ft. 4 in.
17. 41 yd. 2 ft.
18. 8 yd. 2 ft. 4 in.
19. 17,600 yd.
20. 33 yd. 1 ft.
21. 275 yd.
22. 1 mi. 184 rd. 5 yd. 2 ft. 4 in.
23. 2 mi. 269 rd. 2 ft. 6 in.
24. 3 mi. 40 rd.

Art. 355.

1. 351 sq. ft.
2. 216 sq. ft.
3. 36 sq. ft.; 9 sq. yd.
4. 195 A. 50 sq. rd.
5. 32,400,000 A.
6. 7 ft.
7. 15 ft.

Art. 359.

1. 125 cu. in.
2. 120 cu. in.
3. 86,400 cu. in.
4. 1,800 cu. ft.; 3,110,400 cu. in; 13,464. 9 + gal.
5. 296 cu. yd. 8 cu. ft.
6. 37,037 cu. yd. 1 cu. ft.

Art. 363.

1. 12 qt. 1 pt.
2. 400 qt.
3. 98 qt.
4. 28,350 qt.
5. 4 pk.
6. 10 pk.
7. 160 pk.
8. 100 pk.
9. 200 qt.
10. 576 qt.
11. 25 qt.
12. 96 qt.
13. 1,008 pt.
14. 1,280 pt.
15. 400 pt.
16. 800 pt.
17. 3 bu. 4 qt.
18. 6 bu. 1 pk.
19. 37 bu. 2 pk.
20. 10 bu. 5 qt.

Art. 365.

1. 35,232 oz.
2. 72,144 oz.
3. 160,128 oz.
4. 625 lb.
5. 20,600 lb.
6. 375 lb.
7. 177 cwt.
8. 150 cwt. 65 lb.
9. .625 cwt.
10. .625 T.
11. .894 T.
12. .104 T.

Art. 368.

1. 174,012 pwt.
2. 3,420 pwt.
3. 4 lb. 2 oz. 19 pwt.
4. 1 lb. 8 oz. 3 pwt.
5. 27 ℔. 3 ℥. 2 ℈.
6. 14 ℔. 7 ℥.
7. 2,560 gr.
8. 19,700 gr.

Art. 372.

1. 423 d.
2. 1,326 d.
3. 2,410 d.
4. 500 ¢.
5. 670 ¢.
6. 725 ¢.
7. £25.025.
8. £6.25.
9. £34.0125.
10. $52.86.
11. $684.50.
12. $8,000.
13. 13,685 s.
14. 90$\frac{1}{24}$ s.
15. 5,010 s.

Art. 375.

1. 846 hr.
2. 840 hr.
3. 328 das. 20 hr. 40 min.
4. 4,483 das.
5. 1,013,450 min., 12 sec.
6. 57,600 min.

Art. 378.

2. 1,400 bu.
3. 10 T.
4. 59 mi. 9 rd. 1 ft. 6 in.

Art. 379.

2. 111 A. 1 R. 20 P.
3. 10 cwt. 2 qr. 20 lb.
4. £5. 18 s. 11 d.
5. 2 yrs. 2 mos. 12 das.
6. 1 yr. 4 mos. 7 das.: 7 yrs. 2 mos. 1 da.

Art. 380.

2. 5 oz. 18 pwt. 6 gr.
3. 1 lb. 7 oz. 12 pwt.
4. 4 T. 6 cwt. 2 qr. 17 lb.
5. £342. 11 s. 3 d.

Art. 381.

2. £12. 7 s. 2 d.
3. £10. 2 s. 7 d.
4. 2 lb. 5 oz.
5. 206 rd. 2 yd.

Art. 382.

1. 36 bins.
2. 14 vols.
3. 16 tanks.
4. 10 watches.
5. 2 doz. spoons.